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DESTROYER

GUNFIRE SUPPORT

IN

LANDING OPERATIONS

Destroyer Tactical Bulletin
No. 3-45

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Issued By

COMMANDER DESTROYERS
PACIFIC FLEET

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A16-3/A5-1(3)/A7-3 **DESTROYERS, PACIFIC FLEET**

Serial 0495

4 February 1945

CONFIDENTIAL

DECLASSIFIED
DOD DIR 5200.9

From: Commander Destroyers, Pacific Fleet.
To : Destroyers, Pacific Fleet.

Subject: Destroyer Tactical Bulletin 3-45 (Destroyer Gunfire Support in Landing Operations).

Reference: (a) Pacific Fleet Doctrine for Naval Gunfire Support of Landing Operations (13CL-44).
(b) Destroyer Tactical Bulletin 3-44 (Destroyer Gunfire Support in Landing Operations).

1. Destroyer Tactical Bulletin No. 3-45 (Destroyer Gunfire Support in Landing Operations) is issued by Commander Destroyers, Pacific Fleet, for use and guidance of destroyers of the United States Pacific Fleet.

2. This bulletin is classified as Confidential and will be handled and safeguarded as classified correspondence.

3. This bulletin supplements reference (a).

4. This bulletin is effective on receipt and supersedes Destroyer Tactical Bulletin No. 3-44, which shall be destroyed by burning.

5. Recommended changes to this bulletin are desired from all commands at any time. Changes should be made the subject of separate correspondence although they may have previously been forwarded as a part of a gunnery report.

6. Routine reports of accountability of this bulletin are not required.

7. The Annexes attached to this bulletin are applicable to the KAHOOLAWE Area. Suitable modifications should be made for other areas.

W L Ainsworth
W. L. AINSWORTH

ANNEX
(A) Fire Support Area Grid Chart, KAHOOLAWE Island, T.H.
(B) Destroyer Communications for Naval Gunfire Support.
(C) "Reduced Velocity Charge Procedure" with Range Tables.
(D) Instructions for Use of Radar Beacon Mk.2, Mod 0 and Mk.2, Mod 1.

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PART I

PART I

ELEMENTS OF THE PROBLEM

100. INTRODUCTION.

(A) Shore bombardment is a subject that must be thoroughly understood by all destroyers in order that maximum destructiveness may be fully realized against the enemy. Extensive use has been made of destroyor gunfire support in past landing operations. The effective delivery of shore bombardment fire, which is one of the duties of modern destroyers, will become increasingly important in subsequent fire support missions. The experience gained in past operations and in training areas has been used herein to set down recommended procedures and information pertinent to this subject.

(B) The destroyer should be familiar with, and prepared to deliver, the following classifications of naval gunfire used in shore bombardment.

1. Effect.

    (a) Destruction fire.
    (b) Neutralization fire.

2. Tactical use.

    (a) Close supporting fire.
    (b) Deep supporting fire.
    (c) Counter-battery fire.
    (d) Harrassing fire.
    (e) Interdiction fire.

3. Selection of targets.

    (a) Prearranged or scheduled fire.
    (b) Call fires.
    (c) Fire on targets of opportunity.

4. Technique of delivery.

    (a) Direct fire.
    (b) Indirect fire.

Close cooperation between firing ship and Shore Fire Control Parties is essential in order to obtain maximum results from the limited amount of ammunition available in a destroyer. Starshell illumination to aid night spotting for SFCP and also for troop support may be required.

101. REQUIREMENTS.

(A) Proper alignment of the fire control system and the gun battery is essential. Special attention should be given to the alignment of fuze setters. Interior communications as well as communications between the ship and SFCP should be rapid and reliable. Ship control and fire control personnel must be well-trained.

(B) Before undertaking any bombardment against shore objectives a thorough familiarity with terrain and hydrographic features of the objective and the location of profitable targets must be acquired. The study of available charts, maps, serial photographs, mosaics, relief maps, intelligence bulletins, and other pertinent information will be necessary. If not furnished by higher authority, firing ships will prepare a bombardment plan for each operation in which they participate. All personnel concerned should be thoroughly instructed in this plan prior to commencing operations.

(C) References contained in article 202 of this publication are effective and form, with this publication, a list of required reading.

102. MODIFICATIONS.

Gunfire against shore objectives is essentially the same problem as a firing against a surface target of zero speed with the modifications noted below.

(A) The geographical position of the ship must be continuously and accurately fixed, since this determines the range and bearing of the target in the many instances when direct fire cannot be used.

(B) The elevation of the target above sea level must be considered as the terrain features encountered make much more difficult the correction of the fall of shot.

(C) Set and drift of current affect the solution; when determined, they are set in the computer as the reciprocal of target course and as target speed. The actual course and speed over the ground may be determined by CIC and used by Plot if ship is on steady course or not underway.

(D) When own ship's speed is low, below five (5) knots, the pitometer log is inherently inaccurate. Own ship's speed input to the computer must be carefully checked and set by hand as necessary. Dummy log in engineroom, when installed, may be used to transmit ship's speed to DRT.

(E) Spotting procedure and terminology are found in PacFlt Confidential Letter 13CL-44 and in CSP 2156(B). None other should be used.

(F) Control of ship's gunfire, for the delivery of call fire, is exercised by the SFCP, artillery observers ashore, close-in support craft, or plane spotters. In order that misplaced salvos endangering troops may be prevented, ships must:

1. Commence and cease fire on order of SFCP or other spotter.
2. Apply exactly all corrections to the MPI received from SFCP or other spotter.
3. Maintain plot of front line positions as given by SFCP or other spotter.

103. SHIP CONTROL.

(A) Fixing the ship's position.

1. A grid chart of the objective, to the scale of 1" equals 2000 yards (approach chart) or 1" equals 1000 yards (bombardment chart), on tracing cloth or other translucent medium, must be obtained or prepared and in place on the DRT tracking table. The chart should show shore outlines, elevation contours, target locations, navigational dangers, prominent landmarks, radar targets, etc., and the track the ship desires to follow.
2. CIC determines the ship's position from ranges and bearings taken by optics or radar or both and maintains an accurate DRT track. Check the DRT at frequent intervals, resetting the "bug" to conform to actual navigational cuts as obtained (this will usually be particularly necessary after a turn or variation in speed). Determine set and drift of the current or actual course and speed over the ground and furnish this information to Plot.
3. The use of the radar beacon by Method "ABLE", as described in Annex DOG, offers a very accurate means of fixing a ship's position relative to the beacon when the exact location of the radar beacon is known.

(B) Steam at desired low speed that will allow good control of the ship and that the tactical situation will permit. If necessary to lie to or anchor, maintain heading by use of engines. Best results for indirect fire will be obtained if ships steam on steady course and at constant speed.

(C) Select a track that will require as few turns as possible and will permit the maximum number of guns to bear.

(D) Operate as close inshore as safe navigation, the tactical situation, and the type of fire required to reduce the objective will permit. The habitual use of echo ranging equipment (to range on coral heads, reefs, etc.) and fathometer will be found to greatly aid safe navigation.

104. FIRE CONTROL PROCEDURES.

The methods described in the following paragraphs are applicable to a 5"/38 battery with a Mark 37 Gun Director and a Mark 1 Computer. Additional information may be found in "Fire Control Notes for Destroyers", Serial 01141, dated 12 June 1944.

(A) Indirect Fire. (No offset point of aim employed)

1. Duties of CIC.

(a) Furnish range, bearing and elevation of assigned target to Plot and Control. The range and bearing are established from a predetermined point which is one minute in advance and through which the ship will pass.
(b) When the ship is at that predetermined point send a "Mark" to Plot as a signal to start the time motor of the computer.
(c) Check generated range and bearing against navigational (observed) range and bearing before opening fire. Do not open fire unless there is an agreement within 100 yards in range and 50 yards in deflection. This check will particularly be necessary after a turn of any magnitude or after a change of speed before opening fire. Once fire has been commenced and a station other than own ship is spotting DO NOT change the generated setup, as this will cause pyramiding of spots.
(d) Send elevation of target to Plot in feet.
(e) Transmit "Salvo" and "Splash" to SFCP. An indicator light or buzzer in the circuit with the time-of-flight clock (In Plot) will be an effective aid.
(f) Relay to Plot and Control any spots, orders, or information received from SFCP.
(g) Keep an up-to-the-minute plot of own front lines on the chart.
(h) Record range, deflection, and elevation spots.

2. Duties of Plot.

(a) First, place Synchronize Elevation knob in CENTER position and set Observed Elevation dials to zero.
(b) Then, with knob OUT, keep Dip dials set to Advance Range.
(c) Place control switch in LOCAL.
(d) A Target Speed and Target Course may be set into the computer to allow for Set and Drift of the current as received from CIC. Leave these knobs in HAND.
(e) With the Generated Bearing crank OUT, set target bearing (true or relative) as received from CIC.
(f) With the Generated Range crank OUT, set Present Range dials to observed values as received from CIC.

(g) Convert elevation of target (in feet) to mils, and apply as an elevation spot.
NOTE: In the cases where target elevations are encountered which are beyond the scope of the elevation spot mechanism, obtain elevation of target in degrees and minutes. Set target elevation dials to this figure with the Synchronize Elevation knob in CENTER position, then return Synchronize Elevation knob to OUT position and match Dip dials to Advance Range.

(h) Start time motor of computer on "Mark" from CIC.

(i) Furnish CIC with generated ranges and bearings prior to opening fire for check with observed values.

(j) Advise CIC and control when a solution is obtained and Plot is ready to open fire.

(k) Commence firing when directed by Fire Support Plan (Prearranged), by SFCP (Via CIC), or by CIC, using Plot firing key.

(l) Spotting may be by own planes, ship (prearranged fire) or by SFCP (call fire). Spots for prearranged fire should be applied in accordance with a spotting schedule, to be arranged beforehand.

(m) Apply range spots to Present Range. Elevation spots received in feet must be converted to mils before being applied by the Elevation Spot knob. Deflection spots may be applied to the Generated Bearing crank or to the Deflection Spot knob. The former is preferable and is considered the primary method, the deflection spot dial being left on zero. To accomplish this the generated bearing dial should be marked off in mils from tables or devices prepared for converting yards to mils and mils to degrees and minutes. Methods of doing this should be apparent but should definitely provide for instant recognition of the aggregate spot. There are several methods in current use to provide for this modification of the Generated Bearing crank. This method is not subject to the 180-mil limitation that restricts universal use of the Deflection Spot knob and is more accurate.

(n) Report "Spot Applied" to CIC and Control.

(o) Keep a careful check on own ship's speed input to Computer.

(p) Be constantly alert to shift to A.A. or surface setup.

3. Duties of Control.

(a) Maintain supervisory control of battery allowing Plot to apply spots and CIC or Plot to control firing.

(b) Be alert and searching for enemy aircraft, surface craft, and targets of opportunity. Take full control of battery when situation dictates.

(c) Where radar beacon is used for indirect fire furnish CIC with ranges and bearings to the beacon as necessary.

(B) Indirect Fire. (Offset point of aim employed - Point "OBOE" Method).

Conditions frequently arise when targets cannot be seen by the firing ship or spotting plane, and yet the target's location with reference to some prominent landmark is known. This landmark may be visible to a spotting plane or the ship (optically or by radar). In such a case, this landmark can be used as a reference point (Point "OBOE") to which salvos are initially spotted as a check on the fire control solution, and to which fire may be redirected for subsequent checks. When the hitting gun range and deflection have been established for the reference point, range and deflection spots as necessary to hit a selected target are applied, Point "OBOE" remaining the Point of Aim. Point "OBOE" should, when possible, be selected so that the limits of the deflection spot dial are not exceeded to reach the target. This consideration, however, need not be a deterrent to selection of a more suitable Point "OBOE", since a change in generated bearing to obtain the required offset is entirely feasible. Whenever it is desired, in Point "OBOE" firing, to check problem generation any salvo may be redirected to Point "OBOE", without disturbing the set-up, by simply "erasing" the offsetting spots. If the landmark is susceptible to easy destruction do not obtain hits directly on landmark. The duties and set-ups in CIC, Plot and Control are similar to those described in paragraph (A) 1-3, except as modified below:

1. Duties of CIC.

(a) Range, bearing, and elevation of Point "OBOE" may be furnished to Plot as in normal indirect fire. This is not desirable normally if director can train and range on Point "OBOE".
(b) Furnish range and deflection offsets to target from Point "OBOE". This is most efficiently done by use of an auxiliary chart to the scale of 1" equals 500 yards showing point of aim (Point "OBOE") and the location of selected targets. In order to pick off spots necessary to orient the line of fire to reach an offset target, a transparent "offset grid device" marked off in 100 yard squares to the same scale as the above chart, is overlaid on the chart and centered over the point of aim. The range lines of the grid are kept oriented to the line of sight (Gun-Point "OBOE" line). Thus, the required range and deflection spots in yards to reach any target are read directly from the grid.
(c) Inform Plot of difference in elevation between Point "OBOE" and selected target. This may have a considerable effect on offset spots where elevation difference is of some magnitude.
(d) A variation that gives a better gunnery solution on the selected target is as follows: Establish Point "OBOE" and then use indirect fire at the selected target, CIC furnishing

range, bearing, and elevation of target to Plot. If, at any time, it is desired to check the fall of shot, fire may be directed at Point "OBOE" by applying the necessary spots picked off the auxiliary plot and grid while the problem continues to generate about the selected target. Any observed error in the fall of shot on Point "OBOE" will be a necessary spot to apply to generated range and bearing to hit the selected target.

(e) It must be at all times borne in mind that any spots to shift from one target to another must be made with reference to the line of fire to the last target.

2. Duties of Plot.

(a) No change from indirect fire as in paragraph (A) 2. Plot functions mainly to employ data received from CIC or Control in normal fashion to correctly position battery.

(b) If the limits of the deflection spot knob are exceeded, and it is necessary to apply spots by Generated Bearing crank, CIC should be informed when such has been done, as the actual point of aim, Point "OBOE", is shifted by the amount of the spot (to Generated Bearing). The accumulated change due to these deflection spots should be recorded, or recognizable on the modification to the Generated Bearing crank, in order to be able to quickly readjust on Point "OBOE".

3. Duties of Control.

(a) Where possible obtain range, bearing, and elevation of Point "OBOE" and transmit to Plot.

(b) When radar beacon is used as Point "OBOE" carry out procedure in Annex DOG and transmit range and bearing to Plot continuously.

(C) DIRECT FIRE.

Several methods are available for taking targets, which are clearly visible from the ship, under direct fire. Such targets may be targets of opportunity or targets assigned by SFCP. Spotting shall be done by plane or ship. In this type of fire CIC has no direct part but must maintain a setup and information, as possible, to take over immediately if such need should arise. CIC may supply information to Plot and Control where pertinent, such as, elevation of target, coaching director on designated targets, relay of spots and orders from SFCP, etc.

1. FULL DIRECTOR CONTROL.

This method is generally preferred for all but very close ranges (less than 2,000 yards). When there is excessive motion of the ship or the guns, or the gun pointers are poorly trained, this method is preferable.

(a) Duties of Control.

(1) Pointers Selector Lever should be in AUTOMATIC or LOCAL in Directors Mark 37 Mod. 0 and 1; in AUTOMATIC in higher Mods., to keep the director fully stabilized. Pointer should position handwheels for best radar performance (if Radar is being used) - he need not stay exactly on the target. Trainer's Selector Lever should be in AUTOMATIC.
(2) Train director on targets of opportunity or targets assigned by SFCP (coached by CIC as necessary).
(3) Maintain full control of battery. Fire by director pointers key.
(4) Ship spots fall of shot.
(5) Range by stero rangefinder, where possible, unless radar range is known to be more accurate. When range is less than 2,000 yards, transmit reading from rangefinder dials to Plot via telephone (electrical transmission to inaccurate below 2,000 yards).

(b) Duties of Plot.

(1) First, with Synchronize Elevation knob CENTER, set Observed Elevation Dials on Control section of computer at zero.
(2) Then, place knob OUT and set Dip Dials to Advance Range.
(3) Place control switch in SEMI-AUTOMATIC.
(4) Convert elevation of target (in feet) to mils, and apply as an elevation spot.
(5) For firing at urgent targets, when time is not available to make recommended set-up, place Synchronize Elevation knob IN, and match Synchronize Elevation Dials against the fixed index. With this type of set-up, with ranges below 2,000 yards and at low elevations, range spots are not sufficiently accurate, and desired changes in fall of shot are best obtained by use of elevation spot knob, remembering that a one mil elevation spot will change range approximately 100 yards.

(6) Firing on a slope.

(aa) When firing on sloping terrain, differences in elevation from the point of fall of shot to that of the target must be carefully considered. The range correction along the slope necessary to properly position the MPI should be resolved into its components of range and elevation spots as functions of degree or angle of the slope.

(bb) This is particularly essential when subsequent air bursts are desired. If over-spotting in range has been resorted to for obtaining hits on a slope, there is an error in the generated fuze solution due to the excess range spot (above the actual range error of the initial salvo). Thus, Plot must keep a record of aggregate spots required to obtain hits. For air bursts, after correct range has been obtained, an additional arbitrary OUT fuze range spot has proved to be necessary. This OUT spot is from 150 to 200 yards, depending on fuze range calibration practice, and is best applied to ADVANCE RANGE.

(7) For neutralization fire of an area, shift parallax knob to HAND at guns, and set parallax on 0 (for infinity). For destructive fire, parallax correction is desirable, and parallax knob should be shifted to AUTOMATIC at guns.

2. DIRECTOR CONTROL IN TRAIN, TELESCOPE CONTROL IN ELEVATION AT GUNS.

This method is recommended for very close ranges (less than 2,000 yards). It facilitates training all guns on the same target (as opposed to local control). It eliminates range errors, inherent in even well-aligned fire control systems which are magnified at these ranges. A relatively calm sea and well-trained pointers and sight-setters are, however, essential.

(a) Duties of Control.

(1) Follow same initial procedure as in paragraphs (C) 1.(a) (1) - (5) for Full Director Control.

(2) Keep guns in AUTOMATIC in train, and telescope control in elevation.

(b) Duties of Plot.

(1) Follow same initial procedure as in paragraphs (C) 1.(b) (1) - (3) for Full Director Control.
(2) Vertical parallax correction must be removed since the gun pointer is establishing line of sight. This may be done by:

(aa) Construction of a graph of vertical parallax correction (in mils converted from minutes to Pe) versus Advance Range. Then with Advance Range as an argument pick off mils of vertical parallax correction from the graph and apply as a down elevation spot with the elevation spot knob. Apply range and deflection spots at computer. Gun sight-setter keep sight angle and sight deflection matched.
(bb) Sending Advance Range to the guns by telephone to be set on the range scale by the sight-setter. This is not as accurate as (aa). Range and deflection spots are applied at computer.
(cc) Selection of sight angle corresponding to Advance Range on computer from O.P. 551 and setting it in the computer for transmission to guns. All spots are applied at computer. Gun sight-setter keep sight angle and sight deflection matched.

(b) Duties of Gun Mounts.

(1) Use telescope control in elevation ONLY.
(2) Set sight angle and sight deflection,
(3) Pointer should close firing key only when ON the target.

3. LOCAL CONTROL

(a) Local control is only a standby method for close ranges when director control is not available for any reason. It requires a moderately calm sea and well-trained pointer groups. In case of a director disability proficiency in this method may become very important.
(b) Range, deflection, and all spots are set at the gun.

105. SPECIAL TYPES OF FIRE.

(A) REVERSE SLOPE OR "DEFILADE".

This type of fire will be necessary when a target is defiladed, or on a reverse slope from a ship's firing position. To obtain hits, there are two choices; either to move out to increase range and angle of impact, or to shift to reduced charges and increase the curve of the trajectory. The steps to be taken are:

1. Determine the angle of fall required to clear the intervening mask and hit the target. The angle of fall must be greater then the angle of slope or "defilade".
2. Consult the proper trajectory curves with angle of fall desired and adjust the ship's position to fire at the corresponding range. The use of High Elevation Angle Table in O.P. 551 is not recommended. If the angle of slope is greater than the available angle of fall, air bursts may be used.
3. Consult the reduced velocity range table (See O.P. 1285 or Annex CHARLIE) to determine its usefulness in the case at hand.

(B) REDUCED VELOCITY CHARGE.

This type of firing has recently been instituted for the 5"/38 caliber battery. It affords a more plunging fire and enables reverse slope firing to be conducted at closer ranges. The control features are covered in Annex CHARLIE and have proven very satisfactory. For the velocity currently in use (1200 f.s. I.V.) the reduced velocity range table O.P. 1285 has been prepared.

(C) ILLUMINATION.

Illumination by starshells has found considerable employment in amphibious operations. Its greatest use has been in area illumination to aid ground troops in attack and in protection against infiltration and night enemy counter-attacks. The problem posed here is a simple one, but it must be remembered that starshells should be so placed that own troops and installations are not silhouetted and empty starshell cases (35 lbs) fall outside of own lines. Range should be selected so as not to be less than about 7,000 yards where possible. The use of short ranges is conducive to parachute failure. When starshell illumination is supplied for call fire the illumination is supplied so that the SFCP can see the fall of shot. For this purpose place starshells 1,500 feet directly over the target.

(D) PLANE SPOT METHOD.

When plane spot is available and target designation is difficult the use of the "lay on me" method may prove quite useful. The plane flies the G-T line from the ship and is tracked by the director. When over the target, the plane zooms or changes altitude appreciably. At that moment the range and bearing is noted and used for the initial salvo. The time interval between the determination of this range and bearing and the opening salvo should be as short as possible.

(E) 40 MM FIRE

40mm fire can be effective when controlled by the main battery director. No horizontal parallax correction is supplied so that, except for neutralization fire, this omission must be considered. Correction may be made by using the forward 40mm mount as the master mount in full automatic and toeing-in the after mount(s) by leaving train in local and using impacts of the master mount as a train point of aim.

(F) FIRING OVER OWN TROOPS OCCUPYING ELEVATED POSITIONS.

If ship must fire over own troops occupying an elevated position between ship and target proceed as follows:

1. Determine elevation of target, elevation of troop position, and horizontal distance between the two. Let the difference in elevation be Y and the horizontal distance be X.
2. By reference to the trajectory curves determine the range at which the ordinate of the trajectory X yards from the point of impact is safely greater than the difference in elevation, Y. This range is the limiting range outside of which it is safe to fire.
3. Consider suitability of reduced velocity charges.

(G) AIR BURSTS.

Air bursts are a very effective weapon against personnel and lightly protected ground installations. They exert their optimum effect when placed 25 to 50 feet directly over the target. This is best obtained on level terrain by application of an "OUT" 150 to 200 yards fuze range spot. During actual shore bombardment firings, small adjustments to the sight angle may be necessary dependent on the terrain and/or the range (see Column 19 O.P. 551).

Note: It is recommended that all destroyers fire an Air Burst Calibration Practice, using a target sled, with rakes supplied by the towing vessel, to determine the proper fuze range spot for the individual ship fire control system. This spot will generally be from 150 to 200 yards at 8000 yards range. WP Bursts will be obtained in a similar manner except an additional up 2 mil sight angle spot will be necessary (based on the 8000 yards calibration practice).

Small inherent negative errors in the fuze computing mechanism and small negative errors of time fuzes plus negative class "B" errors of the computer or rangekeeper are all contributing factors causing short air bursts. It can therefore be readily seen why tests and experience have proven the necessity for the "OUT" fuze range spot. An additional elevation spot should be applied if necessary to correctly position bursts. When firing in areas with steep elevation gradients this procedure will be necessarily modified unless the impact adjustment has been correctly made. With present SFCP spotting methods this will not usually be so done since SFCP's are trained to overspot in range on slopes in order to compensate for difference in elevation between that of point of fall of shot and that of target. Therefore, before successful air bursts may be obtained after impact adjustment in this fashion, the excess range introduced in overspotting must be removed. This may be done by subsequent spotting of bursts (as is usual), but this method may be tedious, particularly when error has been such as to give continued impacts, and no quantitative reference exists. If a record is kept in Plot of total spot necessary to move the fall of shot an amount equal to the initial error of the MPI this excess is indicated and should be removed by the range spot knob. The algebraic sum of this excess range and the arbitrary out 150 to 200 yards fuze range spot is the correction which must be applied to the range spot knob. Any further correction must be by means of the elevation spot knob to raise or lower the bursts. If the first attempt at air bursts results in impacts a radical in range spot or up elevation spot will hasten the desired result. Position of troops must be considered. In obtaining the initial ground adjustment, it is urged that range spots be applied as changes to present range rather than by use of the range spot knob. This will result in a quicker and more accurate solution of the fire control problem. Pyramiding of excessive spots in advanced range is prevented and the problem of obtaining satisfactory air bursts is considerably simplified. At all time the ship must be assured by prefiring conference or by voice radio just how the SFCP is taking account of elevation; e.g., by overspotting, spotting direct and giving slope, or by spotting direct and giving elevation difference. This understanding will insure that the fundamentals of the problem are recognized.

106. MISCELLANEOUS NOTES.

(A) PRELIMINARY BOMBARDMENT AND PREARRANGED FIRE.

1. Except for the harassing value in preventing repair work, destroyer fire is not very effective against airfield runways. More profitable targets for destroyer fire can usually be found in the vicinity and include grounded planes, shops and facilities, fuel dumps, etc.
2. Precision bombardment against point targets not visible from ships requires spotting to be effective. One plane per firing ship is required in order to obtain best results. For efficient spotting in night area bombardment, one plane for each two ships is the minimum requirement.

3. Bombardment at extreme ranges, without air spot, is usually ineffective.
4. Air spotting is extremely difficult during morning or evening twilight, since difficulty is experienced in seeing tracers and burst flashes (on which spotter relies at night) or smoke puffs (on which spotter relies by day).
5. Whenever a plane is assigned to spot for a destroyer bombardment, much difficulty can be avoided if the spotter has previous knowledge of the ship's plans, targets selected, and proposed procedure. To this end, the firing ship should furnish the spotter a copy of the bombardment plan prior to each operation, if at all practicable to do so.
6. In order to neutralize enemy air fields, bombardments which continue day and night for several days may be carried out. When destroyers operate in pairs on such a mission, best results will be obtained if only one destroyer fires at a time, the other destroyer being ready to deliver counter-battery fire at once if shore batteries open up.
7. During night bombardments, the bursts of a destroyer's own shells exploding ashore are frequently reported by lookouts or other ship's personnel as enemy gunfire. To avoid needless opening of the range and conversely to insure that actual enemy batteries are promptly taken under fire, topside personnel should guard against this common error.
8. For scheduled fire, remember that the ship is a part of a complex and carefully-worked-out program. Firing must begin on time and must be distributed over the scheduled time. Insure that fire does not take on a regular, predictable pattern by varying salvo interval and distribution of the fall of shot. When furnishing close support for landing operations, be guided as to termination of or lifting of fire by the boat movements rather than by the time schedule.
9. If HOW Hour is delayed, vessels assigned to render close support to the landing must remain and provide that support to the landing unless otherwise ordered by superior authority. If such delay will prevent the vessel from performing some other mission on her schedule, so inform the appropriate superior authority; but do not abandon the fire support mission unless directed to do so.
10. When furnishing close support during a landing:

    (a) Keep clear of boat lanes.
    (b) Take any targets of opportunity on the beach under fire promptly, prior to HOW Hour; support the landing by destroying or silencing any batteries detected firing on own boats.

2. For call fire in vicinity of own troops, be sure that the error of the first salvos is in a safe direction; i.e., if firing over own troops which are to the right of target, be sure that the deflection error will be to the left.
3. Destroyers will frequently discover targets of opportunity in interdicted zones occupied by own troops. These should be promptly reported to SFCP with a request to open fire upon them, but fire must not be opened until authority to do so has been received from SFCP (who are usually in a better position to determine whether such fire will endanger own personnel) unless it is clearly evident that our troops will not be endangered.
4. Before resuming fire support that has been interrupted to take enemy aircraft under fire, unload any loaded guns on a safe bearing to seaward and check the setting of fuzes on all projectiles in the ammunition train to insure that short bursts will not occur.
5. Searchlight illumination is reported to clearly reveal certain camouflaged targets which are not easily seen by daylight. On the other hand, searchlights provide a good point of aim for enemy fire.
6. Several instances have been reported where only the seaward walls of Japanese structures were of reinforced concrete; the walls facing the lagoon were found to be non-reinforced and breechable by 5" AAC projectiles.
7. The constant necessity for accurate navigation cannot be too highly stressed. Every means available must be utilized to the greatest extent in order that the initial errors in indirect fire will not be excessive. To make the SFCP's spotting more effective the interval of time between receipt of spot and next salvo during adjustment should be as short as possible, consistent with the efficiency of the shipboard team. Set and drift or course and speed made good over ground must be at all times known and introduced into the problem.
8. Personnel employed for radio liaison with SFCP must be thoroughly grounded in the elements of the problem and familiar with Gunnery, CIC, Ship Control, and navigation. They should be authorized to initiate and answer communications to minimize delay.

(C) GENERAL

1. Optimum conditions for destruction of block-houses and other above-ground targets include:

   (a) Very close range (1500 yards or less), using common projectiles.
   (b) Favorable light conditions for clear definition of targets, which will probably be camouflaged.

(c) Be prompt to lay smoke screens if and when ordered by Commander Attack Force.
(d) Take care not to fire air bursts over own boats or fire on close support craft.

11. On prearranged fire, if several destroyers are in one fire support unit and trouble is experienced in identifying own salvos, fire a salvo of dye-loaded projectiles deliberately short into the water. This may be done on the initial salvo if necessary, or at any time during the firing, by means of a down spot in range and elevation (if firing on a slope).

12. On prearranged fire, walk the salvos back and forth by small spots to insure that the target area is thoroughly covered. If target is a long narrow strip, coverage may be obtained by setting on the computer a target course in the direction the sector runs from the initial point of aim, and setting a target speed sufficient to cover the sector in the time desired. Start the time motor of computer with first salvo.

13. Where fall of shot is obscured by dense foliage or smoke, marker shots will prove helpful. For this purpose an illuminating projectile fuzed to burst over the target area may be used or white phosphorous projectiles may be fire. When using WP be sure to use the correct ballistics (OCL A17-42), See DesPac Monthly Order, Ordnance No. 155 and PhibsPac ltr. AL18 - Revision 1.

14. A wider coverage per salvo than is normally obtained may be desirable against certain targets (tank farms, runways, exposed personnel, etc.). If and when desirable, a deflection spread can be obtained by setting parallax corrections at infinity.

15. When firing at targets at night or in reduced visibility with no observation of fall of shot available and with firing conducted according to a predetermined firing plan, a correction to ship's planned track obtained from later or more accurate fixes, should be reflected as a spot applied to all subsequent predetermined offsets.

(B) CALL FIRE.

1. The value of call fire is directly proportional, in most cases, to the promptness with which it is commenced after receipt of a request for fire. Proceed expeditiously to the firing position and open fire as promptly as possible consistent with insuring that guns are laid on the assigned target.

(c) A position such that the prevailing wind will blow the dust and smoke clear of the line of sight.
(d) A steady gun platform. Existing conditions will determine whether this can best be obtained by remaining underway, lying to, or anchoring. If lying to or anchored, use engines as necessary to keep guns bearing. Keep Plot and CIC informed as to engine movements.
(e) Searchlights at night may assist in seeing these objectives.

It is probable that not all of these conditions can be fulfilled, but ships should select the best combination that circumstances permit.

2. When circumstances require the firing ship to fire from well offshore (as when firing on reverse slopes or delivering plunging fire), and spots from SFCP or spotting planes are not available, a second destroyer close inshore may be able to spot and to assist the firing ship in selecting appropriate targets. The close-in destroyer will, furthermore, be able to fix her position with greater accuracy than will the firing ship if the area contains no prominent landmarks or radar targets usable at long range. If circumstances are such that the close-in destroyer can anchor, she should do so and report her position to the firing ship, who can then use her as a reference point from which the position of the firing ship can be plotted by optical or radar range and bearing.
3. Consult the latest BuOrd publications regarding projectile penetrations and fuzing. For proper selection of type of fuze and projectile to be used against various types of targets consult PacFlt ltr. 13CL-44.
4. It is recommended that spot application be concentrated at one station unless manifestly impossible. Where this is not done the situation is highly susceptible to misapplication of spots and confusion is invited. Control of gunfire has proved to be much more reliable under all conditions when one station is applying all spots.

PART II

QUALIFICATION COURSE FOR DD's IN SHORE BOMBARDMENT AND GUNFIRE SUPPORT

200. GENERAL

(A) This section contains the Destroyer Shore Bombardment Qualification Course promulgated by Commander Destroyers, Pacific Fleet, and known as Exercise Group G-24. Included are component exercises A through L, containing opportunities for training and qualifications.

(B) A ship's performance in exercises D through H, which set forth a total of forty (40) qualifications, determines its rating in proficiency in shore bombardment.

1. To achieve the rating of "SUPERIOR" a ship must meet all but four (4) or less of the total qualifications.
2. To achieve the rating of "SATISFACTORY" a ship must meet all but seven (7) or less of the total qualifications.
3. Failure to meet eight (8) or more of the qualifications is considered unsatisfactory.

201. OBJECTIVES OF COURSE

(A) To improve the performance of destroyer gunfire support in landing operations.

(B) To present a standardized procedure for rating ships in shore bombardment.

202. REFERENCES PERTINENT TO SHORE BOMBARDMENT

The references pertinent to shore bombardment are listed below. They may be obtained from the Type Commander, or command scheduling the exercise.

(A) A DRT target area chart to the scale 1" equals 1,000 yards.

(B) ComGenFMFPac Training Memorandum 18-44.

(C) PacFlt 13CL-44 of 1 May 1944, "Pacific Fleet Doctrine for Naval Gunfire Support of Landing Operations" (and subsequent editions thereof).

(D) CSP 2156(B).

(E) ComGenFMFPac General Order 35-44, "Naval Gunfire Support in Landing Operations".

(F) PhibsPac Circular Letter AL15 - Revision 1.

PART II

2. That each safety observer has personally seen the OP, knows where it is, and can recognize it.
3. That each safety observer has been instructed that if the OP enters his sight, he shall cause his gun to cease firing immediately.

(D) Cease firing immediately on order of the OCE or the SFCP. After cease firing, loaded guns may only be unloaded to seaward, at discretion of individual commanding officer.

(E) During simulated counter battery fire, in which a white phosphorous burst represents an enemy battery, insure that the ship fires at the point of impact of the burst and not at the blast of rocket or mortar used to fire the WP projectile.

(F) During call fire, make no change in true target bearing on the computer after initial salvo has been fired except those resulting from generated bearing or spots. After each course change, check fire control solution with new fix.

205. FLEXIBILITY OF PROCEDURE

(A) The OCE possesses overall authority over the conduct of the exercises. However, the SFCP has total control of whether or not firing on the beach is permitted. In addition, because of his greater familiarity with the procedure, the SFCP can be expected to direct the proceedings. He will instruct ships as to stations to take, exercises to fire, when to fire two phases on the same approach, and the like.

(B) The OCE or individual ships are authorized to repeat exercises or deviate from the prescribed procedure provided:

1. More training is gained.
2. The OCE and SFCP are notified.
3. The OCE and SFCP concur.

206. REPORTS REQUIRED

All ships, within 7 days after completion of firing will submit a report of the exercise to CominCh (Readiness Division) with one copy each to Type Commander, ComPhibsPac, ComGenFMFPac, plus command scheduling the exercise if not one of the above. Reports should consist of the following:

*(A) Chronological record of events.

**(B) Copy of radio log for exercise (include log for naval gunfire support (SFC) frequency and naval gunfire control frequency.

* Do not send to ComPhibsPac.
** Do not send to CominCh or ComPhibsPac.

203. PREPARATORY STEPS PRIOR TO THE EXERCISES

(A) Lay out a track of expected movements during each exercise. Tracks specified, sectors, and fire support areas are approximate. Safety of navigation is paramount.

(B) The ship will benefit if an officer is sent to observe the fall-of-shot with the SFCP. The command scheduling the practice will arrange for this if desired.

(C) Establish communication with SFCP before opening fire. See Communication Annex BAKER for further details.

(D) Distribute fire among guns as desired to equalize wear. However, do not change guns during any one adjustment.

(E) Insure that "salvo" and "splash" are transmitted for each salvo of call fire. This is "life insurance" for the spotters, reducing the time they are exposed to sniper fire.

(F) Fire slowly and deliberately. Wait for spot after each salvo before loading unless "rapid fire" has been ordered. Do not load any gun until spot has been received and/or proper fuze setting has been applied. Otherwise, air bursts over boats or our own troops may occur.

(G) Experience has shown that many prematures have occured because projectiles presumably set on safe have had a fuze setting. Ship should take every precaution to eliminate premature bursts.

204. SAFETY PRECAUTIONS

(A) The SFCP is located at an Observation Post (OP) whose location is indicated by "OP" on target area charts.

(B) Before any firing make one non-firing run close in to identify OP and other terrain features. Have safety observers on the bridge at this time. The SFCP will light a smoke pot, show a light at night, fly a flag, or display other means to facilitate recognition as requested by the ship.

(C) Prior to commencing fire, each Commanding Officer will insure:

1. That a safety observer is stationed at the check sight of each firing gun. The sight setter will match his sight angle and deflection continuously.

(C) Comments and recommendations of commanding officer, listed by exercises. These should include comments and recommendations of executive officer and gunnery officer.

(D) A separate brief report for Exercise K (Motor Torpedo Boat Attacks) should be submitted to MTBRon Commander, commenting on effectiveness of attack and recommendations for improvement of exercise.

207. OUTLINE OF EXERCISES. (For further details, see complete descriptions of exercises in pages following).

Exercise & Phase	Range Band	Speed	Designated Target	Type of Fire	Spot By	Type of Control	Battery Firing	Ammunition Allowance	Guns Per Salvo	Impact Salvos	Air Burst Salvos	Identification Salvos	Illumination Salvos	REMARKS
A	3000	DLS	Visible	D	Ship	Director	Main	6 AAC	2	3				Repeat run if necessary
B	6000	DLS	Grid Coord.	I	SFCP	Computer	Main	33 AAC	2	5		1		First target.
									2	3				Second target.
									1			1		Second target.
									2	3				Third Target.
									3		3			Third target
C	1500	0	Pillbox	D	Ship	Director	Main	5 AAC	1	5				
						Dir.(Mod)	Main	5 AAC	1	5				
						Loc.Control	Main	20 AAC	1	20				4 salvos per mt.
						Loc.Control	40mm	16/bbl	All bbls					Mounts fire individually.
						Mk. 51 Dir.	40mm	16/bbl	All bbls					Mounts fire individually.
						Mk. 37 Dir.	40mm	16/bbl	All bbls					Mounts fire together.
D-1	8000	DLS	Grid Coord.	I	SFCP	Computer	Main	As required	1				As required	Illuminate for SFCP
	3000	DLS	Grid Coord.	I	SFCP	Computer	Main	5 AAC	1	5				Fire during SS illumination.
D-2	3000	DLS	Grid Coord.	I	SFCP	Computer	Main	5 AAC	1	5				Hits on Pt OBOE then offset to target.
D-3	1500	0	Pillbox	D	Ship	Director	Main	5 AAC	1	5				Use searchlight lumination.

NOTES: (1) Sectors - as designated by SFCP
(2) Approach Courses - at discretion of commanding officer.
(3) DLS - Desired Low Speed.
(4) Full gun salvos are figured on basis of 5-gun ship. For 4-gun or 6-gun ships, decrease or increase ammunition accordingly.

207. OUTLINE OF EXERCISES (Cont'd)

Exercise & Phase	Range Band	Speed	Designated Target	Type of Fire	Spot By	Type of Control	Battery Firing	Ammunition Allowance	Guns per Salvo	Impact Salvos	Air Burst Salvos	Identification Salvos	REMARKS
E	3000	DLS	Grid Area	I	Ship	Computer	Main	24 AAC	2	6	5	1	Pre-arranged fire.
			WP Burst	D	Ship	Director	Main	5 AAC	1	5			Counter battery fire.
F	Desig.	DLS	Desig.	I	SFCP	Computer	Main	36 AAC	2	3			1st target.
									2	5			1st target, rapid fire
			Desig.	I	SFCP	Computer	Main		2	3			2nd target.
									3		3		Over 2nd target.
			WP Burst	D	Ship	Director	Main		1	5			Counter battery fire
G	-	-	Sleeve	D	Ship	Director	Main	As required	All				Do not use radar.
							40mm		All				
							20mm		All				
H	As required	DLS	Grid Coord (Reverse Slope)	I	SFCP	Computer	Main	43 AAC (27 rds reduced velocity powder charges	2	3			Red. Vel. 1st target.
									5	2			Red. Vel. Wait 5' between salvos
									2	3			Red. Vel. 2nd target.
									5	1			Red. Vel. 2nd target.
									2	3			Serv.Vel. 3rd target.
									5	1	1		Serv.Vel. Wait 5' between salvos.
I	12,000	DLS	Grid Coord.	I	SFCP	Computer	Main	20 AAC	2	10			For training SFCP spotters
	Approach	20kts.	Visible	D	Ship	Director	Main	10 AAC	2	5			Direct destructive fire
	6,000	DLS	Grid Coord.	I	SFCP	Computer	Main	20 AAC	2	10			For training SFCP spotters

NOTES: (1) Sectors - as designated by SFCP.
(2) Approach Courses - at discretion of commanding officer.
(3) DLS - Desired Low Speed.
(4) Full gun salvos are figured on basis of 5-gun ship. For 4-gun or 6-gun ships, decrease or increase ammunition accordingly.

207. OUTLINE OF EXERCISES. (Cont'd)

Exercise & Phase	Range Band	Speed	Designated Target	Type of Fire	Spot by	Type of Control	Battery Firing	Ammunition Allowance	Guns per Salvo	Impact Salvos	Air Burst Salvos	Identification Salvos	REMARKS
J	6000	DLS	Grid Coord.	I	Plane	Computer	Main	50 AAC	2	25			For training plane spotters
K	-	-	MTB	D	Ship	Director	All	None					Simulate firing only
L	5000	DLS	Grid Coord.	I	SFCP	Computer	Main	5 AAC	1	5			Radar Beacon Methods "ABLE"
			Radar Beacon Offset.		SFCP	Computer	Main	5 AAC	1	5			Radar Beacon Methods "BAKER"

NOTES: (1) Sectors - as designated by SFCP.
(2) Approach Courses - at discretion of commanding officer.
(3) DLS - Desired Low Speed.
(4) Full gun salvos are figured on basis of 5-gun ship. For 4-gun or 6-gun ships, decrease or increase ammunition accordingly.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(A) EXERCISE A.

MAIN BATTERY — DIRECT DESTRUCTIVE FIRE

1. TACTICAL SITUATION. Ship patrolling 3,000 yards off beach takes enemy target under fire.

2. SHIP CONTROL. Steam 3,000 yards off beach at desired low speed. Approach course is at discretion of commanding officer. Sector as designated by SFCP.

3. SPECIAL PROVISION. Target will be a visible target designated by SFCP.

4. FIRING PROCEDURE.

   (a) When in all respects ready, fire three 2-gun salvos at designated target. Ship spots.

   (b) SFCP note MPI and inform ship of correct spots after third salvo.

   (c) Repeat firing procedure if directed by SFCP. Use same approach if practicable.

5. GUNNERY STANDARDS.

   (a) MPI of first salvo must be within 150 yards of target.

   (b) MPI of third salvo must be within 50 yards of target.

6. AMMUNITION ALLOWANCE.

   6 rounds AAC per run.

EXERCISE C (Cont'd)

(b) Main battery hits by third salvo of each phase.

(c) Automatic weapons dispersion under 500 yards with 20% hits.

6. AMMUNITION ALLOWANCE

(a) 30 rounds 5" AAC.

(b) 16 rounds per barrel per phase, 40mm.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24.

(From ComDesPac Serial 0501 of 3 March 1944)

(C) EXERCISE C

MAIN BATTERY
HEAVY AUTOMATIC WEAPONS — DIRECT DESTRUCTIVE FIRE

1. TACTICAL SITUATION. A destroyer takes discernible pillboxes and beach defenses under fire at very close range with main battery and heavy automatic weapons.

2. SHIP CONTROL. Lie to, broadside to beach, at 1500 yards in sector designated.

3. SPECIAL PROVISIONS

(a) Use various fire control setups to determine best gun control to destroy pillbox designated.

(b) Keep SFCP informed of the fire control setup being used.

4. FIRING PROCEDURE.

(a) With main battery in full automatic, fire five single-gun salvos (from same mount) at pillbox designated. Ship spots.

(b) Fire five single-gun salvos (from same mount) in director control of train, telescope control in elevation, master key fire. (Pointer should keep his key closed only when he is on target).

(c) With main battery in local control, pointer fire, fire four rounds from each mount.

(d) Heavy automatic weapons: (Fire all barrels)

(1) Individually fire mounts that bear, using local control.
(2) Individually fire mounts that bear in full automatic with Mk. 51 director.
(3) Fire all mounts that bear in full automatic with Mk. 37 director.

5. GUNNERY STANDARDS

(a) All main battery salvos within 250 yards of target.

EXERCISE B (Cont'd)

5. GUNNERY STANDARDS

(a) MPI of first salvo on each target must be within 250 yards of target.

(b) Hits on each target must be achieved by third salvo.

(c) First identifying salvo must be correctly placed 200 yards off shore.

(d) WP identifying salvo must be 25' - 50' in air over second target.

(e) Air bursts must be correctly adjusted by third salvo.

6. AMMUNITION ALLOWANCE

(a) 33 rounds AAC.

(b) 1 round WP.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24.

(From ComDesPac Serial 0501 of 3 March 1944)

(B) EXERCISE B

MAIN BATTERY INDIRECT CALL FIRE

1. TACTICAL SITUATION. Ship delivers close supporting fire with SFCP spotting.

2. SHIP CONTROL. Steam 6000 yards off the beach at desired low speed. Approach course is at discretion of Commanding Officer. Sector as designated by SFCP.

3. SPECIAL PROVISION. Request location of friendly front lines from SFCP.

4. FIRING PROCEDURE.

(a) When in all respects ready, fire 2-gun salvos at designated target for "No change, no change". SFCP spots.

(b) If error exceeds 250 yards, Combat obtain a new fix and supply new data to Plot before firing next salvo.

(c) After getting a first salvo within 250 yards of target area, fire 2-gun salvos until "No change, no change" has been received.

(d) When "No change, no change" has been received, fire one 2-gun salvo in water 200 yards off shore from target area by application of proper spot.

(e) In same manner as above, fire 2-gun salvos at second target designated.

(f) When hits have been obtained on second target, fire one WP projectile as an identifying salvo 25' - 50' above target.

(g) Fire at third target designated by SFCP whose elevation differs as much as practicable from previous one. Fire 2-gun salvos until "No change, no change" has been received.

(h) When hits have been obtained on third target, fire three 3-gun salvos of air bursts 25' - 50' over this target.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24.

(From ComDesPac Serial 0501 of 3 March 1944).

(D) EXERCISE D - PHASE ONE (TWO SHIPS)

MAIN BATTERY — INDIRECT CALL FIRE, NIGHT

1. TACTICAL SITUATION. Ship is directed to illuminate enemy area with starshells. Second ship is directed to deliver close supporting fire.

2. SHIP CONTROL.

   (a) Illuminating ship steam 8,000 yards off the beach at desired low speed. Approach course is at discretion of commanding officer. Sector as designated by SFCP.

   (b) Supporting ship steam 3,000 yards off the beach at desired low speed. Approach course is at discretion of commanding officer. Sector as designated by SFCP.

3. SPECIAL PROVISIONS.

   (a) Starshell illumination is for benefit of SFCP, not ship.

   (b) SFCP will rotate ships through successive firing stations for all phases of Exercise D. Phases may not necessarily be fired in numerical order.

4. FIRING PROCEDURE.

   (a) When both ships are in position and in all respects ready, illuminating ship fire single gun starshell salvos at designated target. SFCP spot each salvo until, "Maintain illumination" is received. Ship then maintain illumination using single gun salvos, 10 - 15 second salvo interval, until "Cease Illumination" is given.

   (b) When directed, supporting ship fire five single gun salvos at designated target. SFCP spots.

5. GUNNERY QUALIFICATIONS.

   (a) Correct illumination adjustment by second salvo.

   (b) Maintain adequate illumination after adjustment.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(F) EXERCISE D - PHASE THREE

MAIN BATTERY DIRECT DESTRUCTIVE FIRE, NIGHT

1. TACTICAL SITUATION. Ship is directed to illuminate beach installations with searchlight and deliver direct destructive fire.

2. SHIP CONTROL. Lie to, broadside to beach, at 1,500 yards in sector designated.

3. SPECIAL PROVISIONS. None

4. FIRING PROCEDURE. When in all respects ready, illuminate designated target with searchlight and fire five single gun salvos. Ship spots.

5. GUNNERY QUALIFICATIONS.

(a) Searchlight on target within 15 seconds after opening shutters.

(b) Open fire within 30 seconds after opening shutters.

(c) Hits by third salvo.

6. AMMUNITION ALLOWANCE.

5 rounds AAC.

EXERCISE E (Cont'd)

5. GUNNERY QUALIFICATIONS.

(a) Commence fire on schedule.

(b) Cease fire on schedule.

(c) Cover effectively the assigned area despite interruptions.

(d) Take enemy battery under fire within one minute.

(e) Obtain hits on simulated enemy battery by third salvo.

(f) After firing on enemy battery, resume scheduled firing within one minute.

(g) Correct air burst adjustment (Over target) by third salvo.

6. AMMUNITION ALLOWANCE.

29 rounds AAC.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(G) EXERCISE E

MAIN BATTERY PREARRANGED FIRE

1. TACTICAL SITUATION. A fire support unit carries out a schedule of prearranged fire just prior to HOW Hour. Counter-battery fire is also executed.

2. SHIP CONTROL.

(a) Steam 3,000 yards off beach at desired low speed. Approach course is at discretion of OCE. Sector as designated by SFCP.

(b) Maneuver evasively when under simulated enemy fire.

3. SPECIAL PROVISIONS.

(a) Target areas will be designated by SFCP prior to H-69.

(b) WP impact burst will represent enemy battery.

(c) Only the ship scheduled to be firing at the time of each WP burst shall fire on it.

4. FIRING PROCEDURE.

(a) Carry out schedule of fire, commencing and ceasing fire on time, firing 2-gun salvos. Ship spots.

H-69 to H-56	Fire Support Group 8
H-51 to H-38	Fire Support Group 9
H-33 to H-20	Fire Support Group 10
H-15 to H-2	Fire Support Group 11

(b) Fire first salvo short in water as identifying salvo.

(c) Cover assigned area using unpredictable pattern (by spots or use of a "target" course and speed).

(d) Deliver promptly counter-battery fire. Fire five single gun salvos at point of impact of WP burst, then resume scheduled fire.

(e) Fire at rate to cover entire period.

(f) Fire last five salvos as air bursts in 2-gun salvos.

EXERCISE F (Cont'd)

(e) Using 2-gun salvos, fire on new target within 2 minutes of receipt of designation until "No change, no change" salvo.

(f) After "No change, no change" salvo, fire three 3-gun salvos of air bursts 25' - 50' over second target.

(g) When occuring, fire five single gun salvos at simulated enemy battery.

5. GUNNERY QUALIFICATION.

(a) Reach firing station and establish communications in 9 minutes.

(b) Open fire on first target in 2 minutes after reaching firing station.

(c) Error of MPI of first salvo not to exceed 250 yards.

(d) Hits on target by third salvo.

(e) MPI of rapid fire not to shift over 100 yards in range and 50 yards in deflection.

(f) Shift to new target and open fire in 2 minutes.

(g) Error of MPI of first salvo on second target not to exceed 250 yards.

(h) Hits on second target by third salvo.

(i) Position third air burst 25' - 50' over (second) target.

(j) Take WP impact burst under fire in 1 minute.

(k) Hits on WP impact burst by third salvo.

6. AMMUNITION ALLOWANCE.

36 rounds AAC.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(H) EXERCISE F

MAIN BATTERY INDIRECT CALL FIRE

1. TACTICAL SITUATION. Ship, on screening station in transport area, is assigned fire support duty by Naval Gunfire Control Officer, the OCE. Ship is directed to contact SFCP on designated frequency and deliver call fires. Enemy batteries are promptly taken under fire.

2. SHIP CONTROL. Fire support ships patrol 8,000 yards off beach. SFCP asks OCE to designate a ship to deliver call fire. Designated ship must then proceed from patrol station to designated fire support station. Ship should arrive at fire support station within nine (9) minutes of receipt of orders, then steam at desired low speed during firing. Make evasive maneuvers during simulated counter-battery fire.

3. SPECIAL PROVISIONS.

   (a) SFCP will assign frequencies.

   (b) Request location of friendly front lines from SFCP.

   (c) WP impact burst fired by SFCP will represent enemy battery.

4. FIRING PROCEDURE.

   (a) Within 2 minutes after reaching fire support station open fire on designated target with 2-gun salvos. SFCP spots.

   (b) When hits in target area are obtained, SFCP order, "Rapid fire, five 2-gun salvos", and observe MPI.

   (c) SFCP direct ship, "Stand by for next phase". Ship report "Ready" unless in a position which will require a turn within 3 minutes, in which case turn and report "Ready" when steady on new course.

   (d) By means of a radical spot, SFCP designate a new target whose elevation should differ by at least 200 feet from previous target.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24
(From ComDesPac Serial 0501 of 3 March 1944)

(I) EXERCISE G

MAIN BATTERY
ALL AUTOMATIC WEAPONS

ANTI-AIRCRAFT FIRING
(SURPRISE ATTACK)

1. TACTICAL SITUATION. A ship, delivering call fire, visually sights enemy aircraft. Attack is immediately taken under fire with main battery and heavy automatic weapons. Bombardment is resumed on last assigned target.

2. SHIP CONTROL. Maneuver as necessary to unmask battery.

3. SPECIAL PROVISIONS.

   (a) Plane must be picked up visually. Do not use radar.

   (b) Use rangefinder range.

   (c) Report visually detected aircraft to SFCP.

   (d) Report air attack repelled to SFCP.

   (e) Unload guns to seaward.

4. FIRING PROCEDURE.

   (a) When plane is sighted, shift to AA setup and commence firing at sleeve when towing plane is at a safe position angle. Fire all guns that bear, including automatic weapons.

   (b) Shift to surface setup and resume call fire.

   (c) Repeat AA setup as necessary.

5. GUNNERY QUALIFICATIONS.

   (a) Shift from local computer setup to AA setup and open fire when plane is at a safe position angle.

   (b) Resume bombardment within 90 seconds after repelling aircraft attack.

   (c) First subsequent bombardment salvo must not contain air bursts.

6. AMMUNITION ALLOWANCE. As required.

EXERCISE H (Cont'd)

(b) Error of MPI of first salvo must not exceed 250 yards.

(c) Obtain hits by third salvo.

(d) Shift of MPI on delayed salvo must not exceed 100 yards in range and 50 yards in deflection.

(e) Fire on second target within 2 minutes of receipt of designation.

(f) Error of MPI of first salvo must not exceed 250 yards.

(g) Obtain hits by third salvo.

(h) Fire on third target within 2 minutes of receipt of designation.

(i) Error of MPI of first salvo must not exceed 250 yards.

(j) Obtain hits by third salvo.

(Note that the air bursts are not included in the qualifications for this exercise).

6. AMMUNITION ALLOWANCE.

(a) 43 rounds AAC.

(b) 27 rounds REDUCED velocity charges.

(c) 16 rounds SERVICE velocity charges.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(J) EXERCISE H

MAIN BATTERY INDIRECT (REVERSE SLOPE) CALL FIRE

1. TACTICAL SITUATION. Ship is directed to deliver call fire on targets located on reverse slopes.

2. SHIP CONTROL. Steam at range required at desired low speed in approximate position designated by SFCP.

3. SPECIAL PROVISIONS.

    (a) SFCP will assign frequency.

    (b) SFCP will not designate target until ship reports in each case that she is on firing station.

    (c) OP must not be in the line of fire.

    (d) For REDUCED velocity firing, keep fuzes set on safe.

4. FIRING PROCEDURE.

    (a) REDUCED velocity firing.

        (1) When in all respects ready, fire 2-gun salvos for "No change, no change", on designated target. SFCP spots.
        (2) After hits are obtained, fire one full salvo.
        (3) SFCP advise ship of range and deflection pattern.
        (4) Check fire. After five minutes ship fire second full salvo on same target.
        (5) Shift to second target designated by SFCP. Fire 2-gun salvos for "No change, no change".
        (6) After hits are obtained fire one full salvo.

    (b) SERVICE velocity firing.

        (1) Same as for REDUCED velocity firing. After 5 minutes delay, however, fire one full salvo air burst and fire on only one target.

5. GUNNERY QUALIFICATIONS.

    (a) Open fire on first target within 3 minutes of receipt of designation.

EXERCISE I (Cont'd)

5. GUNNERY QUALIFICATIONS. None

6. AMMUNITION ALLOWANCE.

50 rounds AAC

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(K) EXERCISE I

MAIN BATTERY

INDIRECT CALL FIRE
DIRECT DESTRUCTIVE FIRE

1. TACTICAL SITUATION. None. This exercise is to provide an opportunity for training of SFCP spotters. It also provides the ship with an opportunity of firing while approaching a shore target at high speed.

2. SHIP CONTROL.

(a) Steam 12,000 yards off the beach at desired low speed. Firing course is at discretion of commanding officer. Sector as designated by SFCP.

(b) When directed by SFCP, close to 6,000 yards at 20 knots. Approach course is at discretion of commanding officer.

(c) Steam 6,000 yards off the beach at desired low speed. Firing course at discretion of commanding officer.

3. SPECIAL PROVISIONS.

(a) At 12,000 yard range band SFCP will designate targets for indirect fire. Use salvo fire, wait for SFCP spot before firing next salvo, unless "Rapid fire" has been requested.

(b) When directed to shift to the 6,000 yard range band, ship will be requested to deliver direct destructive fire on visible target designated by SFCP.

(c) At 6,000 yard range band SFCP will designate targets for indirect fire. Use salvo fire with SFCP spots.

4. FIRING PROCEDURE.

(a) When in all respects ready, fire ten 2-gun salvos at targets designated for 12,000 yard range band. SFCP spots.

(b) When directed, and while making 20 knot approach, fire five 2-gun salvos at designated visible target. Ship spots.

(c) When in all respects ready, fire ten 2-gun salvos at targets designated for 6,000 yard range band. SFCP spots.

EXERCISE J (Cont'd)

5. GUNNERY QUALIFICATIONS. None

6. AMMUNITION ALLOWANCE.

50 rounds AAC.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24
(From ComDesPac Serial 0501 of 3 March 1944)

(L) EXERCISE J

MAIN BATTERY

INDIRECT CALL FIRE
(FOR TRAINING PLANE SPOTTERS)

1. TACTICAL SITUATION. Ship provides deep support missions. An air spotter is employed.

2. SHIP CONTROL. Steam 6,000 yards off the beach at desired low speed. Approach course is at discretion of commanding officer. Sector as designated by SFCP.

3. SPECIAL PROVISIONS.

(a) This exercise is devoted to the training of inexperienced plane spotters. Regular call fire procedure will be followed. Control of the spotting will be exercised in each case by "ACE", senior plane spotter. The individual spotters will select their own targets, pick out their coordinates for these targets and send them to the firing ship. SFCP will be monitoring the firing circuit at all times. Before the ship will be allowed to fire on the target selected, SFCP must come up on the circuit, and give permission for firing to be commenced.

(b) The procedure for plane spot will be as follows:

(1) "ACE", senior control plane, will be asked by SFCP to designate plane for adjusting fire on target that cannot be observed by SFCP.
(2) "ACE" will then designate the plane to SFCP that is to do spotting.
(3) SFCP will in turn make the following transmission to "ACE", "Have - (Plane call sign) contact - (ship's call sign) and SFCP - on frequency call sign".
(4) When ship, plane, and SFCP are all up on the spotting frequency (it will be necessary for ship and SFCP to tune their radio to the planes), a round of WP will be fired by SFCP to land anywhere in the target area. The coordinate of this burst will be selected by plane spotter and given to ship. The firing on this and subsequent targets will then proceed in the normal manner.

4. FIRING PROCEDURE. When in all respects ready, and when directed by Plane Spotter, fire 2-gun salvos on targets designated.

EXERCISE K (Cont'd)

5. GUNNERY QUALIFICATION. None.

6. AMMUNITION ALLOWANCE. None.

NOTE: Submit separate report for this exercise in accordance with orders of command scheduling the exercise.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24

(From ComDesPac Serial 0501 of 3 March 1944)

(M) EXERCISE K

MAIN BATTERY (SIMULATE)
HEAVY AUTOMATIC WEAPONS (SIMULATE) MOTOR TORPEDO BOAT ATTACK

1. TACTICAL SITUATION. Gunfire support unit is attacked by Motor Torpedo Boats.

2. SHIP CONTROL. Steam as necessary to conduct exercise in which participating. When MTB attack occurs or when directed, proceed as necessary to intercept and repel assault.

3. SPECIAL PROVISIONS.

(a) Daytime attack - Night conditions will be simulated. MTB's will make repeated attacks to provide personnel an opportunity to become familiar with the problems. If time is limited, some of the ships may continue shore bombardment problem on direction of OCE. However, at least half of bombarding ships will break off and simulate active defense against MTB's.

(b) Night attack - This will be carried out at discretion of Motor Torpedo Boat Squadron Commander. All bombarding ships will take defensive maneuvers under command of OCE.

(c) Communications - Motor Torpedo Boat Squadron Commander call "SURFBOARD" will be on NGF Control Net. OCE will be called "LANCELOT".

(d) Main battery gunfire will be simulated with 36" searchlight illuminating MTB for 30 seconds. 12" lights will be used to simulate fire by automatic weapons. Lights will be used day and night.

4. FIRING PROCEDURE.

(a) THERE WILL BE NO FIRING.

(b) SIMULATE gunfire with all batteries.

(c) When computer solution is steady, illuminate main battery target with searchlight. (Day or night). Hold illumination for 30 seconds. Shift to next target. Repeat this procedure until MTB's are repelled.

EXERCISE L (Cont'd)

4. FIRING PROCEDURE.

(a) Method "ABLE" - When in all respects ready, fire single gun salvos at designated target. SFCP spots.

(b) Method "BAKER".

(1) DO NOT FIRE AT BEACON.
(2) Apply 150 yards down spot to present range. (See Annex DOG).
(3) When in all respects ready, fire single gun salvos at target designated by offsets. SFCP spots.

5. GUNNERY QUALIFICATIONS. None.

6. AMMUNITION ALLOWANCE.

10 rounds AAC.

208. SHORE BOMBARDMENT EXERCISE GROUP G-24
(From ComDesPac Serial 0501 of 3 March 1944)

(N) EXERCISE L

INDIRECT CALL FIRE
(USING RADAR BEACON MK. 2,
MOD. 0 AND MK. 2, MOD. 1)

MAIN BATTERY

1. TACTICAL SITUATION. Ship is directed to deliver call fire on targets located by Radar Beacon using Methods "ABLE" and "BAKER". See Annex DOG (Instructions for use of Radar Beacon).

2. SHIP CONTROL. Steam 5,000 yards off the beach at desired low speed. Approach course at discretion of commanding officer. Sector as designated by SFCP.

3. SPECIAL PROVISIONS.

(a) Method "ABLE" - Beacon is used as a navigational aid.

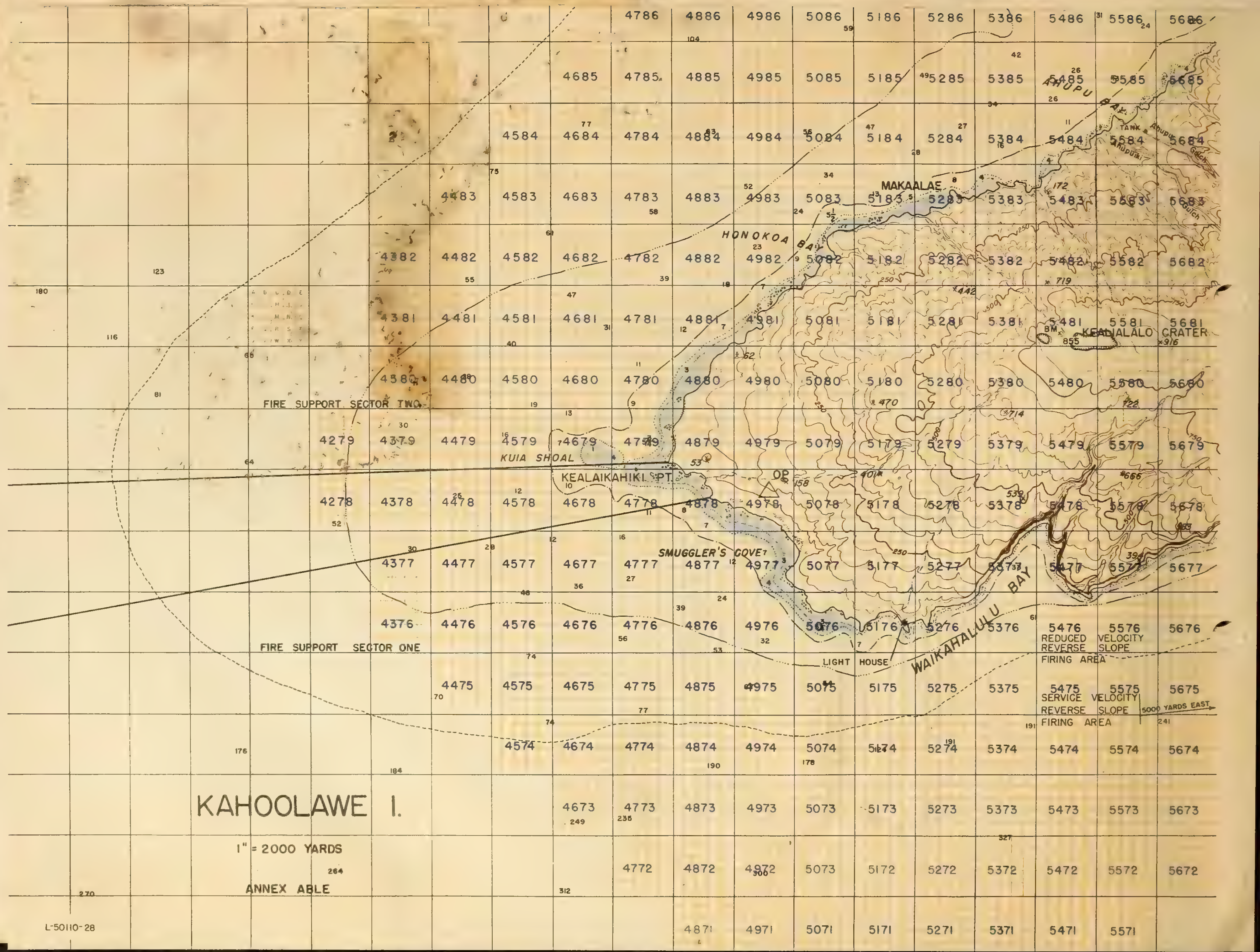
(1) Radar Beacon is to be used with MK. 3, MK. 4, and MK. 12 fire control radars.
(2) SFCP prescribes use of radar beacon using method "ABLE" sending location of beacon and designating letter which is to be keyed. SFCP requests frequency on which radar beacon is to be set and Mark of equipment firing ship is using.
(3) Establish contact with beacon by searching designated bearing.
(4) Train director on beacon and supply ranges and bearings to CIC and Plot. CIC keeps track of beacon for navigational purposes and supplies Plot with information similar to that used in indirect fire.

(b) Method "BAKER" - Beacon is used as a continuous reference point for offsets.

(1) Radar beacon is to be used with MK. 3, MK. 4, and MK. 12 fire control radars.
(2) SFCP prescribes use of radar beacon using method "BAKER" and designating letter which is to be keyed. SFCP requests frequency on which radar beacon is to be set and Mark of equipment firing ship is using.
(3) Establish contact with beacon by searching designated bearing.
(4) Train director on beacon and supply ranges and bearings to CIC and Plot.
(5) SFCP will designate target by offsets from beacon.

DECLASSIFIED
DOD DIR 5

EXERCISE L



KAHOOLAWE I.

1" = 2000 YARDS

ANNEX ABLE

L-50110-28

ANNEX ABLE TO D.T.B. 3-45

FIRE SUPPORT AREA GRID CHART,
KAHOOLAWE ISLAND, T.H.

ANNEX BAKER TO D.T.B. 3-45

DESTROYER COMMUNICATIONS FOR NAVAL GUNFIRE SUPPORT.

Little authentication has been needed so far, but when used it will be the current Voice Authenticator System.

Shipboard voice modulated transmitters frequently suffer casualties due to gunfire shock. Communication Officers should prepare a list of alternate circuits in order of preference over which they may be able to regain contact with the SFCP in case of failure to equipment either on board or ashore.

It is not expected that destroyers assigned Fighter Director duties will be assigned Fire Support missions at the same time. However, with the shift of Fighter Director work to VHF circuits, it is theoretically possible for a destroyer to undertake both assignments. On several occasions destroyers have been assigned both fire support and air support missions.

IV MONITORING AND RECORDING.

Before undertaking a firing mission it is a good idea for a destroyer to shift copying the Fox Schedule to Emergency Radio. This leaves Main Radio free for operational and tactical communications, and is particularly helpful when the TBL transmitter is located forward as in the 2100 ton class.

During Call Fire destroyers will be logging the following circuits: Primary Fox Schedule, Task Force Commander's Common (CW), TBS, Naval Gunfire Control Net, and Shore Fire Control Party Net (for such periods as assigned). As there is no radio remote position in Control or Plot it has been found most convenient to record (log) the fire control circuits in CIC. Some destroyers have monitored (controlled) these circuits from CIC, while in other destroyers the Commanding Officer has exercised control and monitored from the Bridge. The chief disadvantage of monitoring from CIC is the increase in noise level incident of transmission of salvo and splash signals, relaying of fire control orders, and information received via this circuit.

Lists of all firing ships and SFCPs ashore with their calls (TBS or numbered calls) must be conveniently arranged in CIC, chart-house, Radio I and III, and on the Bridge. Calls on Fire Support nets will be TBS call for ships and commanders having these, and numbered calls from the Comm plan for SFCPs and NLOs.

V FIRE SUPPORT NETS.

Described in detail in "PACIFIC FLEET DOCTRINE FOR NAVAL GUNFIRE SUPPORT OF LANDING OPERATIONS" (PacFlt Conf. ltr. 13CL-44), and "Centcom TWO, Annex D".

ANNEX BAKER TO DESTROYERS TACTICAL BULLETIN NO. 3-45
DESTROYER COMMUNICATIONS FOR NAVAL GUNFIRE SUPPORT

I PREPARATORY.

Communication Officers of destroyers assigned fire support mission must check communication plans and attack orders the minute they are received and from them make lists of all frequencies that may be used in the current operations. These should then be set up and calibrated on all receivers, and on transmitters having the requisite frequency band and type of emission. Prior to such calibration in a forward area it must be ascertained that the area commander or SOPA will permit testing, and what precautions apply thereto.

Radio Officers, Technicians, and Radiomen should insure that their voice transmitters are properly modulated for use on low power. Because of the proximity of numerous ships during fire support phases, one over-modulated voice transmitter will cause howls in the speakers of all other stations on the circuit, thus disrupting communications. Special precautions must be taken to avoid this when using the powerful TBL model transmitter.

When one station uses excessive power operators tend to reduce their receiver gain, which opens them to danger of missing signals from other stations whose transmitters are correctly adjusted on low power. Therefore, when one station is far stronger than others operators must, nevertheless, maintain moderately high receiver gain to ensure reception of the normal signals.

Officer personnel engaged in fire support communications should be proficient in the use of Shore Fire Control Code, current voice authentication system, and Shackle Code.

II CHOICE OF EQUIPMENT.

Fire Support Communications may be expected on MF and HF voice frequencies, generally in the 3000-6000 kcs band. The selection of frequencies depends upon the radio equipment in the units participating. It will be necessary for destroyers in many instances to obtain and install special equipment. As soon as this becomes evident, the vessel or unit commander affected should initiate action, to secure earliest installation.

III RECENT DEVELOPMENTS IN DOCTRINE.

Fire Support Communications today are normally by voice, therefore elaborate communication teams including Radiomen who can read CW are not normally used. However, in emergencies, as for example against enemy jamming, Key (A2 or A1) may be necessary. Each destroyer should train at least four Radiomen in the use of the Shore Fire Control Code and its two letter CW abbreviations.

VIII COMMUNICATIONS WITH SHORE FIRE CONTROL PARTIES AND SPOTTING AIRCRAFT.

Destroyers should always be prepared to use aircraft spotting facilities if they should unexpectedly be available. It sometimes occurs that carrier, battleship, and cruiser spotting planes are free for another assignment, and therefore the aircraft spotting doctrine, frequencies, calls and grids employed by individual ship-based aircraft should be given careful consideration. When establishing communications with spotting aircraft, destroyers and Shore Fire Control Parties should tune receiver and zero beat transmitter to the spotting plane's signal as it is difficult for spotting aircraft to make accurate minor transmitter frequency adjustments in the air. In the case of SC1 aircraft frequencies are preset and the aircraft can make no adjustment while in the air.

VI FIRING MISSIONS - PROCEDURE.

On approaching the objective destroyers will either be notified by despatch from the Attack Force Commander or by prearranged plan when to set up a watch on the Naval Gunfire Control Net. At this time it is customary to start logging. If notification is delayed it is well to stand a listening watch on the Naval Gunfire Control Net as a safeguard. When a Shore Fire Control Party asks for supporting fire, destroyers will be called by their TBS call on the Naval Gunfire Control Net (guarded by all standby firing ships), assigned a SFCP or NLO to work with, and a frequency on which to work. This working frequency will have a code name, and the destroyer should have it already calibrated. Voice transmitter should be shifted at once, and communications opened with SFCP or NLO. If the destroyer has both TBL and TCS, it should keep a transmitter on each frequency. If not, it will have to shift TBL over to the Shore Fire Control Party Net.

In any case destroyers should continue to guard the Naval Gunfire Control Net and to log it. If short of receivers they may use the RBO, or any other receiver of correct coverage aboard. Yeoman should be able to log voice circuits after a little practice (Not in shorthand). The training of all rated Yeomen, Signalmen and Quartermasters in radio voice procedure, and practice in logging will contribute to the success of the mission by providing helpful information from the additional circuits that can be manned, and the possibility of monitoring the Fire Control Nets from several outlets in the firing ship.

VII COMMUNICATIONS WITH SHORE FIRE CONTROL PARTIES.

Destroyers may experience difficulty in raising either the SFC or NLO on first coming up on the Shore Fire Control Party Net, because in landing or establishing their equipment on the beach it may have been jarred off frequency. Operators should be sure to tune their receivers back and forth across the calibrated frequency and zero beat transmitter to the shore fire control party's signal until two way communication is established.

Upon completion of a firing mission and after leaving the Shore Fire Control Party Net it is routine for the destroyer to report back to the Attack Force Commander on the Naval Gunfire Control Net giving the percentage of bombardment ammunition remaining onboard in shackle code, and to indicate her availability for another assignment.

B. Tactical uses of the Radar Beacon. Typical tactical situations under which the SFCP or ship could call for use of the beacon include:

1. When the visibility is poor, (night or hazy weather). The beacon provides a reference point on the land, thereby fixing the ship's position when the beacon's position is known.

2. Where there is a lack of a conspicuous land mark. The beacon supplies the land mark, the grid coordinates of the beacon being supplied by the SFCP.

3. When the SFCP does not know its position in relation to the known grid coordinates - in this case the beacon shows the ship and relative position of the SFCP and the method "BAKER" system of firing can be used.

C. Chronological procedure for establishing contact with Radar Beacon:

1. The SFCP prescribes use of beacon, method of target designation, location of beacon, letter it will be keyed with, and requests frequency on which beacon is to be set.

2. Ship then tells SFCP on what frequency to set the beacon. This is accomplished by the ship radioing the last two digits of its fire control radar frequency plus or minus the offset and the mark radar it is using. The technician for MK 3 / MK 4 radars or the range operator for MK 12 radars will determine the radar frequency, add or subtract the offset, and tell the communicator the last two digits of this frequency.

3. When beacon is turned on, SFCP so advises ship over communications by saying that the Radar Beacon* is keying.

4. Ship sectors fire control radar antenna around beacon bearing, as the radar receiver is retuned to the frequency given to the SFCP, until the beacon signal is received. Ship recognizes Beacon's signal because the echo pip will only be visible during the time the key is making contact which will either be short or extended time periods corresponding to dots and dashes of the keyed letter.

5. When beacon is tuned in clearly, ship must tell SFCP that they are receiving the Radar Beacon* and to discontinue keying. Ship will then range and train on beacon as though it were a regular radar echo.

6. When the ship has finished using the beacon, it will radio the SFCP that there is no further need of the Radar Beacon. This is important since individual beacon batteries last for only 3 hours without recharging.

* Use prescribed code name for "Radar Beacon".

ANNEX DOG TO DESTROYER TACTICAL BULLETIN NO. 3-45
INSTRUCTIONS FOR USE OF RADAR BEACONS
MARK 2 MOD. 0 AND MARK 2 MOD. 1

I GENERAL INFORMATION.

A. The MK 2 Mod 0 Radar Beacon is a transponder that may be tuned to any frequency in the band of the MK 3 or MK 4 fire control radar (Details given below for its use also apply to MK 1 Mod 1 Radar Beacon). The MK 2 Mod 1 Radar Beacon is a transponder that may be tuned to any frequency in the band of the MK 12 fire control radar. Both of these beacons are carried ashore by the SFCP to give the firing ship an accurate point of reference for fire control. The bearing and range information given by the beacon is as accurate as the information gained from the radar in its normal use. Maximum range of the beacon is approximately 40,000 yards.

In order to eliminate confusing ground echoes and have only the Radar Beacon pip on the Radar scope, the beacon is set at a frequency of from 2 to 10 megacycles away from the radar transmitter frequency. The radar receiver is then retuned until the pip from the beacon comes in clearly. The proper number of megacycles offset to use is primarily a function of range from radar to beacon - the greater the range the smaller the offset. At normal shore bombardment ranges, five to 10 thousand yards, a seven megacycle offset should be used. At ranges greater than ten thousand yards, smaller offsets from radar transmitter frequency, such as 4 or 5 megacycles offset, should be used. If troublesome land echoes persist when the beacon is tuned in for a particular offset, greater offsets in steps of 1 megacycle should be applied until the interferring land echoes are eliminated. In order to set the frequency of the transponder the proper number of megacycles away from the fire control radar transmitter frequency, the ship's radar transmitter frequency must be known. It will be the technician's responsibility to determine this prior to the operation for the MK 3 / MK 4 radars and the responsibility of the radar range operator for the MK 12 radar.

The beacon will be referred to as "carburetor", or some other code name designated in current communications instructions, during communications. No reference to radar or megacycles as such will be transmitted. SFCP will determine the advisability of using the beacon during tactical situations, but this should not prevent the ship from requesting the use of the beacon.

When notified that it is time to pick up the beacon, the technician in the case of the MK 3/MK 4 radars (the range operator in case of the MK 12 radar) will tune the radar receiver to the beacon frequency while the train and range operators sector the approximate bearing and range of the beacon until it is located.

ANNEX DOG TO D.T.B. 3-45

INSTRUCTIONS FOR USE OF RADAR BEACON
MK. 2, MOD. 0, AND MK. 2, MOD. 1.

III TECHNICAL AND OPERATING INFORMATION.

A. Technicians' Procedure when MK 3 / MK 4 Radar is used.

1. Obtaining the MK 3 / MK 4 frequency. This can be done with the LW test equipment or with a scope and the calibrated wavemeter located in the duplex panel of the transmitter.

(a) Determining the MK 3 / MK 4 frequency with the LW test equipment.

(1) Turn on LW test equipment and radar transmitter and allow thirty minutes warm-up for both. Only the wavemeter portion of the LW is used.

(2) Connect Test Dipole to input jack (jack marked WM IN) of the wavemeter. As a general rule no attentuation will be required. (Attenuation should be added if the meter goes off scale when the wavemeter is not tuned to resonance.).

(3) Rotate wavemeter micrometer dial until there is a pronounced dip in the wavemeter micrometer. Frequency of the radar transmitter may then be obtained from the Frequency vs. Micrometer Head graph which is located inside the lid of the LW carrying case.

(b) Determining MK 3 / MK 4 frequency with the wavemeter located in the duplexing panel of the transmitter frame.

(1) With transmitter in stable operation (on for at least 30 minutes), make the following scope connections.

(aa) Vertical plates to "monitor" jack in duplex panel.

(bb) Horizontal amplifier switch on scope to "on" (internal sweep of scope not used).

(cc) Horizontal "gain" at zero (this will put a single vertical line on the scope).

(dd) Set wavemeter bottom adjustment for maximum length of the vertical line.

(ee) Move the plunger up until another maximum is reached on the scope and read the frequency opposite the marker, being careful of parallax.

(c) After determining the transmitter frequency, the technician must add or subtract an appropriate offset, whichever gives a result

D. Fire Control using Beacon:

1. When the above has been accomplished, ship knows the range and bearing to the beacon and has informed SFCP that keying should be discontinued. This leaves a steady pip on the range operator's scope. A target can now be designated.

2. There is a time lag in the beacon equivalent to 150 yards. This can be compensated by an initial down spot of 150 yards applied to present range.

3. Method "ABLE" or method "BAKER" as shown below will be used. DO NOT FIRE AT THE BEACON, PERSONNEL ARE STATIONED WITH IT.

   (a) Method "ABLE".

   Beacon used as navigational aid when the location of the beacon is accurately known.

   SFCP: Designates target by grid coordinates or target area square.

   Director: Trains on beacon and feeds continuous ranges and bearings to CIC, ranges to Plot.

   CIC: Keeps track on beacon for use as a navigational aid. Supplies Plot with information similar to that used in indirect fire.

   Plot: Computer in local. Applies spots received from SFCP to present range and generated bearing.

   (b) Method "BAKER"

   Use of beacon as a direct continuous point of reference with offsets applied in accordance with orders received from SFCP. SFCP will designate target by offset when the location of the beacon is not accurately known.

4. All other shore bombardment doctrine remains unchanged.

5. If no other means of communication are established, since the beacon permits manual keying, fire orders will be sent over the beacon to the firing ship using the International Code in accordance with CSP 2156 B.

6. Tracking the Beacon with director and computer should give an accurate measure of set and drift (reciprocal of target course and speed).

that pulse may be peaked while still on scope). Read the two digits from frequency meter dial which are opposite scribe mark when transmitted pulse is peaked. These digits with the proper number in front of them give frequency of the MK 12 transmitter.

(d) After determining the transmitter frequency, the operator must add or subtract an appropriate offset, whichever gives a result nearer 45, and then tell this result to the communicator from the SFCP. For example: If frequency meter dial reads 30, operator would tell the communicator that the beacon setting is thirty-seven (for a seven megacycle offset; change appropriately if other offset is necessary).

2. Adjusting the MK 12 Receiver and "T-R" to Beacon frequency. In this discussion it will be assumed that a seven megacycle offset is to be taken above the transmitter frequency. Procedure should be appropriately modified for other offsets and for any offset which is below transmitter frequency rather than above.

(a) **After radar transmitter frequency has been determined,** set frequency meter to a reading 7 megacycles above transmitter frequency. **Example:** If transmitter frequency is "30" set reading opposite scribe mark to "37".

(b) Turn test oscillator "on". This is accomplished by turning "Pls Osc" switch on test panel one position clockwise from full counter clockwise off position (No dial marking is seen on this "on" position).

(c) Tune "Osc" tuning knob at lower right of test panel until oscillator pip is peaked on test scope. ("Attenuator" at center top of panel which applies to oscillator should be adjusted for minimum attenuation, i.e., dial at lowest possible reading. **Turning oscillator tune knob clockwise increases oscillator frequency).**

This tunes test oscillator to frequency to which Beacon is to be tuned.

(d) Put Receiver Sensitivity Control in Manual position on sensitivity control unit and turn sensitivity control clockwise just short of receiver blocking.

(e) Turn receiver tune control on transmitter-receiver chassis counterclockwise* until oscillator pip begins to appear at right of sweep on range operator's scope. Reduce sensitivity as needed so that adjustment of receiver tune may peak oscillator pip without pip saturating.

* It is possible that on some MK 12's, receiver tune control should go clockwise for an increase in frequency.

nearer 700, and tell the communicator with the SFCP the last two digits of this frequency. For example: If ship's MK 3 / MK 4 frequency is 690, technician would tell the communicator that the beacon setting is nine seven (for a seven megacycle offset; change appropriately if other offset is necessary).

2. Tuning in the MK 2 Mod 0 Beacon on the MK 4 Radar Receiver. The technician will have the test scope connected at the transmitter frame to give him an "A" type presentation. Upon receipt of orders to begin tuning for the beacon, ONLY the local oscillator tuning knob which turns the green dial will be used. If the beacon frequency is above the transmitter frequency, turn the knob so that the numbers on the dial increase*, and vice versa. You will recognize the beacon from the fact that it will be keyed by a predescribed code letter; i.e., the echo pip will only be visible during the time the key is making contact which will either be short or extended time periods corresponding to dots and dashes. Adjust the tuning knob for maximum amplitude of the beacon signal.

   THAT IS ALL THE TUNING THAT IS TO BE DONE. DO NOT TOUCH ANY OTHER CONTROL. The technician must remain at the transmitter ready to retune the receiver in case enemy air or surface attack necessitates conventional use of the radar.

   Emergency measures:

   If the beacon frequency is so far away from radar transmitter frequency that the signal is lost due to the critical tuning of the r-f amplifiers, an increase in signal/noise can be obtained by by-passing the r-f amplifiers.

   On some equipments, one of the frequencies, either seven megacycles above or below the transmitter frequency, will be beyond the limits of the critical "cathode tune" adjustment. In this case, the echo pip will be small and distorted. If possible, have the shore fire control party change to the other frequency, otherwise, tune as best you can.

B. Range Operator's Tuning Procedure when MK 12 Radar is used.

1. Obtaining the MK 12 frequency with the test set built into MK 12 transmitter receiver unit.

   (a) Turn on MK 12 transmitter and allow 30 minute warm-up.

   (b) Adjust intensity control so that sweep appears on test unit scope.

   (c) Tune frequency meter until representation of transmitted pulse appears on test scope and is peaked. (If transmitted pulse goes off scope, adjust "Amp Input Att" at right hand side of panel so

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* There may be some MK 3 / MK 4 radars where numbers increase as frequencies decrease.

III STEPS AND RADIO PROCEDURE TO BE USED IN OPERATION OF RADAR BEACON.

STEPS	TRANSMISSION
(a) NAVAL GUNFIRE SPOTTER PRESCRIBES USE OF RADAR BEACON AND METHOD OF TARGET DESIGNATION, SENDS LOCATION AND DESIGNATING LETTER WHICH IS TO BE KEYED. REQUESTS FREQUENCY ON WHICH RADAR BEACON IS TO BE SET AND MARK EQUIPMENT FIRING SHIP IS USING.	(a) "RADAR BEACON* WILL BE USED ON THIS PROBLEM-TARGET WILL BE DESIGNATED BY COORDINATES (OR OFFSET SPOT)-RADAR BEACON* LOCATED AT____ (COORDINATES)-DESIGNATING LETTER_________ REQUEST RADAR BEACON* SETTING AND EQUIPMENT YOU ARE USING - OVER".
(b) FIRING SHIP READS BACK METHOD OF TARGET DESIGNATION, LOCATION AND DESIGNATING LETTER, SENDS FREQUENCY AND MARK EQUIPMENT IT IS USING.	(b) "TARGET WILL BE DESIGNATED BY COORDINATES (OR OFFSET SPOT)-RADAR BEACON* LOCATED AT_____-(COORDINATES)-DESIGNATING LETTER IS_____-SET RADAR BEACON* ON_____(FREQUENCY) TO WORK WITH______ (SHIP MARK RADAR) - OVER".
(c) NAVAL GUNFIRE SPOTTER READS BACK.	(c) "SET RADAR BEACON* ON _____(FREQUENCY) -TO WORK WITH _____(SHIP MARK RADAR) - OUT".
(d) NAVAL GUNFIRE SPOTTER NOTIFIES FIRING SHIP WHEN RADAR BEACON IS KEYING DESIGNATED LETTER.	(d) "RADAR BEACON* IS KEYING - OVER".
(e) FIRING SHIP ACKNOWLEDGES.	(e) "ROGER - OUT".
(f) FIRING SHIP NOTIFIES NAVAL GUNFIRE SPOTTER TO DISCONTINUE KEYING WHEN RADAR BEACON IS IDENTIFIED.	(f) "RECEIVING RADAR BEACON* DISCONTINUE KEYING - OVER".
(g) NAVAL GUNFIRE SPOTTER DESIGNATES COORDINATES OR OFFSET SPOT TO TARGET, DESCRIBES TARGET AND ORDERS "COMMENCE FIRE".	(g) "ROGER BREAK TARGET FROM RADAR BEACON* ________(COORDINATES OF REQUIRED OFFSET SPOT) ENEMY PILLBOX-CLOSE SUPPORTING FIRE - COMMENCE FIRE - OVER".
(h) FIRING SHIP READS BACK.	(h) "TARGET FROM RADAR BEACON______(COORDINATES OR REQUIRED OFFSET SPOT) ENEMY PILLBOX - CLOSE SUPPORTING FIRE - COMMENCE FIRE - OUT".

PROCEDURE FOR THE CONDUCT OF FIRE IS THE SAME AS PRESCRIBED IN SHORE FIRE CONTROL CODE, 2156(B).

STEPS	TRANSMISSION
(i) NAVAL GUNFIRE SPOTTER NOTIFIES FIRING SHIP THAT THERE IS NO FURTHER NEED OF RADAR BEACON.	(i) "NO FURTHER NEED OF RADAR BEACON* - OVER".
(j) FIRING SHIP ACKNOWLEDGES.	(j) "ROGER - OUT".

* Use prescribed code name for radar beacon.

(f) Turn "TR" tuning knob, located just below Receiver Tune control, clockwise until test oscillator pip is peaked.

Receiver sensitivity should be reduced as needed to achieve a peaked pip that isn't saturated.

Note: It is possible that on some MK 12's, "TR" tune knob should go counter clockwise for an increase in frequency.

(g) Both Receiver and "T-R" are now tuned to frequency at which beacon should come in. If Beacon frequency should be slightly off that called for, its pip might not be clearly visible at this setting of Receiver Tune Control. In this event, keep "T-R" tune fixed, and when certain that beacon is turned on, vary Receiver Tune knob slightly clockwise and counter clockwise until beacon is picked up. The test oscillator can be kept turned on in this procedure to serve as a point of reference, care being taken that oscillator pip doesn't interfere with beacon response.

C. Range Operator's Procedure for MK 3 / MK 4 and MK 12 when Beacon is turned on.

When the time comes to pick up the beacon signal, the approximate bearing and range will be sent to the director from CIC along with the orders to begin searching for it. In the case of MK 3 / MK 4 the technician will be tuning for the beacon signal at the same time and in case of MK 12, the range operator will previously have tuned receiver and "T-R" to proper frequency of beacon. As the beacon has a high sensitivity, relatively high power, and relatively broad antenna beam width, it will be fairly easy to locate; especially as the beacon signal will increase as the land echoes decrease. In addition, the operator will recognize the beacon signal from the fact that it will be keyed with a predescribed code letter; i.e., the echo pip will only be visible during the time the key is making contact which will either be short or extended time periods corresponding to dots and dashes. In normal operation the beacon signal will be the only echo present on the indicator. During the attack the beacon will not be keyed and will look like a large radar echo. Range and train on it as such.

III STEPS AND RADIO PROCEDURE TO BE USED IN OPERATION OF RADAR BEACON.

STEPS	TRANSMISSION
(a) NAVAL GUNFIRE SPOTTER PRESCRIBES USE OF RADAR BEACON AND METHOD OF TARGET DESIGNATION, SENDS LOCATION AND DESIGNATING LETTER WHICH IS TO BE KEYED. REQUESTS FREQUENCY ON WHICH RADAR BEACON IS TO BE SET AND MARK EQUIPMENT FIRING SHIP IS USING.	(a) "RADAR BEACON* WILL BE USED ON THIS PROBLEM-TARGET WILL BE DESIGNATED BY COORDINATES (OR OFFSET SPOT)-RADAR BEACON* LOCATED AT____ (COORDINATES)-DESIGNATING LETTER________ REQUEST RADAR BEACON* SETTING AND EQUIPMENT YOU ARE USING - OVER".
(b) FIRING SHIP READS BACK METHOD OF TARGET DESIGNATION, LOCATION AND DESIGNATING LETTER, SENDS FREQUENCY AND MARK EQUIPMENT IT IS USING.	(b) "TARGET WILL BE DESIGNATED BY COORDINATES (OR OFFSET SPOT)-RADAR BEACON* LOCATED AT_____-(COORDINATES)-DESIGNATING LETTER IS_____-SET RADAR BEACON* ON_____(FREQUENCY) TO WORK WITH_____ (SHIP MARK RADAR) - OVER".
(c) NAVAL GUNFIRE SPOTTER READS BACK.	(c) "SET RADAR BEACON* ON _____(FREQUENCY) -TO WORK WITH _____(SHIP MARK RADAR) - OUT".
(d) NAVAL GUNFIRE SPOTTER NOTIFIES FIRING SHIP WHEN RADAR BEACON IS KEYING DESIGNATED LETTER.	(d) "RADAR BEACON* IS KEYING - OVER".
(e) FIRING SHIP ACKNOWLEDGES.	(e) "ROGER - OUT".
(f) FIRING SHIP NOTIFIES NAVAL GUNFIRE SPOTTER TO DISCONTINUE KEYING WHEN RADAR BEACON IS IDENTIFIED.	(f) "RECEIVING RADAR BEACON* DISCONTINUE KEYING - OVER".
(g) NAVAL GUNFIRE SPOTTER DESIGNATES COORDINATES OR OFFSET SPOT TO TARGET, DESCRIBES TARGET AND ORDERS "COMMENCE FIRE".	(g) "ROGER BREAK TARGET FROM RADAR BEACON* ________(COORDINATES OF REQUIRED OFFSET SPOT) ENEMY PILLBOX-CLOSE SUPPORTING FIRE - COMMENCE FIRE - OVER".
(h) FIRING SHIP READS BACK.	(h) "TARGET FROM RADAR BEACON______(COORDINATES OR REQUIRED OFFSET SPOT) ENEMY PILLBOX - CLOSE SUPPORTING FIRE - COMMENCE FIRE - OUT".

PROCEDURE FOR THE CONDUCT OF FIRE IS THE SAME AS PRESCRIBED IN SHORE FIRE CONTROL CODE, 2156(B).

(i) NAVAL GUNFIRE SPOTTER NOTIFIES FIRING SHIP THAT THERE IS NO FURTHER NEED OF RADAR BEACON.	(i) "NO FURTHER NEED OF RADAR BEACON* - OVER".
(j) FIRING SHIP ACKNOWLEDGES.	(j) "ROGER - OUT".

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* Use prescribed code name for radar beacon.

(f) Turn "TR" tuning knob, located just below Receiver Tune control, clockwise until test oscillator pip is peaked.

Receiver sensitivity should be reduced as needed to achieve a peaked pip that isn't saturated.

Note: It is possible that on some MK 12's, "TR" tune knob should go counter clockwise for an increase in frequency.

(g) Both Receiver and "T-R" are now tuned to frequency at which beacon should come in. If Beacon frequency should be slightly off that called for, its pip might not be clearly visible at this setting of Receiver Tune Control. In this event, keep "T-R" tune fixed, and when certain that beacon is turned on, vary Receiver Tune knob slightly clockwise and counter clockwise until beacon is picked up. The test oscillator can be kept turned on in this procedure to serve as a point of reference, care being taken that oscillator pip doesn't interfere with beacon response.

C. Range Operator's Procedure for MK 3 / MK 4 and MK 12 when Beacon is turned on.

When the time comes to pick up the beacon signal, the approximate bearing and range will be sent to the director from CIC along with the orders to begin searching for it. In the case of MK 3 / MK 4 the technician will be tuning for the beacon signal at the same time and in case of MK 12, the range operator will previously have tuned receiver and "T-R" to proper frequency of beacon. As the beacon has a high sensitivity, relatively high power, and relatively broad antenna beam width, it will be fairly easy to locate; especially as the beacon signal will increase as the land echoes decrease. In addition, the operator will recognize the beacon signal from the fact that it will be keyed with a predescribed code letter; i.e., the echo pip will only be visible during the time the key is making contact which will either be short or extended time periods corresponding to dots and dashes. In normal operation the beacon signal will be the only echo present on the indicator. During the attack the beacon will not be keyed and will look like a large radar echo. Range and train on it as such.

1200 f.s. I.V. RANGE TABLES - FROM O.P. 1285

Range Yards	Elevation		Angle of fall	Drift		Drift difference between 2600 f.s. I.V. and 1200 f.s. I.V.	Max. Ord. in feet	Time of Flight in seconds
	Minutes	Degrees & Minutes		Yards	Mils			
500	66	1-06	1-17	.5	1	1	6	1.2
1000	125	2-05	2-15	.8	1	1	28	2.7
1500	196	3-16	3-36	2	2	1	68	4.1
2000	270	4-30	5-04	4	2	1.3	127	5.6
2500	349	5-49	6-40	6	3	1.6	206	7.1
3000	432	7-12	8-24	9	3	2.1	308	8.7
3500	520	8-40	10-17	12	4	2.6	437	10.4
4000	614	10-14	12-21	16	4	3.0	598	12.16
4500	714	11-54	14-36	22	4.4	3.5	796	14.0
5000	821	13-41	17-02	29	5.8	4.0	1030	15.9
5500	963	15-36	19-41	37	6.7	4.7	1310	18.0
6000	1062	17-42	22-35	47	7.8	5.4	1645	20.2
6500	1201	20-01	25-47	58	9.0	6.1	2050	22.5
7000	1355	22-35	29-20	72	10.3	7.0	2545	25.1
7500	1532	25-32	33-18	89	11.9	8.1	3160	27.9
8000	1748	29-08	37-52	112	14.0	9.8	3960	31.3
8500	2042	34-02	43-43	145	17.0	12.3	5130	35.6
8930	2601	43-21	53-30	213	24.0	18.7	7507	43.1
8500	3143	52-23	61-37	284	33.4	28.6	9850	49.7
8000	3417	56-57	65-21	321	40.0	36.0	10930	52.8
7500	3621	60-21	68-02	350	46.7	43.0	11690	55.2
7000	3791	63-11	70-15	373	53.3	50.0	12260	57.0
6500	3942	65-42	72-10	396	61.0	58.0	12710	58.7
6000	4080	68-00	73-53	417	69.5	67.0	13080	60.2
5500	4209	70-09	75-28				13390	61.6
5000	4331	72-11	76-58				13650	62.9
4500	4448	74-08	78-24				13860	64.0
4000	4560	76-00	79-46				14030	65.0

ANNEX (C)

R2	Vs Minutes	Drift Diff. Mils	Tf Seconds
8150	3725	10.4	32.4
8200	3851	10.6	32.8
8250	3880	10.9	33.2
8300	3909	11.1	33.6
8350	3941	11.4	34.1
8400	3972	11.6	34.6
8450	4007	11.9	35.1
8500	4042	12.3	35.6
8550	4083	13.7	36.2
8600	4123	13.1	36.7
8650	4172	13.6	37.4
8700	4221	14.2	38.1
8750	4289	15.0	39.0
8800	4356	15.7	39.9
8850	4478	17.2	41.5
8874	4601	18.7	43.1
8850	4725	20.6	44.6
8800	4849	22.6	46.1
8750	4912	23.8	46.8
8700	4975	25.0	47.6
8650	5022	26.0	48.2
8600	5068	27.0	48.8
8550	5106	27.8	49.3
8500	5143	28.6	49.7
8450	5176	29.4	50.1
8400	5208	30.2	50.5
8350	5236	30.9	50.9
8300	5267	31.7	51.2
8250	5294	32.3	51.5
8200	5321	33.0	51.8
8150	5346	33.7	52.1
8100	5371	34.5	52.3
8050	5394	35.3	52.6
8000	5417	36.0	52.8
7950	5439	36.6	53.2
7900	5461	37.3	53.3
7850	5483	38.0	53.6
7800	5504	38.7	53.8
7750	5525	39.4	54.1
7700	5545	40.0	54.3
7650	5564	40.8	54.5
7600	5584	41.6	54.8
7550	5603	42.3	55.0
7500	5621	43.0	55.2
7450	5638	43.8	55.4
7400	5657	44.6	55.6
7350	5675	45.1	55.8
7300	5692	45.7	55.9
7250	5709	46.3	56.1
7200	5726	47.0	56.2
7150	5743	47.7	56.4
7100	5759	48.5	56.6
7050	5775	49.2	56.8
7000	5791	50.0	57.0
6950	5807	50.8	57.2
6900	5823	51.6	57.3
6850	5839	52.4	57.5
6800	5854	53.2	57.7
6750	5869	54.0	57.9
6700	5884	54.8	58.0
6650	5899	55.5	58.2
6600	5913	56.3	58.3
6550	5928	57.4	58.5
6500	5942	58.0	58.7
6450	5957	58.9	58.9
6400	5971	59.8	59.0
6350	5985	60.7	59.2
6300	5999	61.5	59.3
6250	6013	62.4	59.5
6200	6026	63.2	59.6
6150	6040	64.2	59.8
6100	6053	65.2	59.9
6050	6067	66.1	60.1
6000	6080	67.0	60.2
5950	6093	*	60.3
5900	6106	*	60.4
5850	6119	*	60.6
5800	6132	*	60.7
5750	6145	*	60.9
5700	6158	*	61.0
5650	6171	*	61.2
5600	6184	*	61.3
5550	6197	*	61.5
5500	6209	*	61.6
5450	6221	*	61.7
5400	6234	*	61.8
5350	6246	*	62.0
5300	6258	*	62.1
5250	6270	*	62.3
5200	6282	*	62.4
5150	6295	*	62.5
5100	6307	*	62.6
5050	6319	*	62.8
5000	6331	*	62.9
4950	6343	*	63.0
4900	6354	*	63.1
4850	6366	*	63.3
4800	6378	*	63.4
4750	6390	*	63.5
4700	6401	*	63.6
4650	6413	*	63.7
4600	6424	*	63.8
4500	6448	*	64.0

* Drift unpredictable at elevations above 70°.

R_2	Vs Minutes	Drift Diff. Mils	Tf Seconds
500	2070	1.0	1.2
1000	2125	1.0	2.7
1100	2139	1.0	2.9
1200	2153	1.0	3.2
1300	2167	1.0	3.5
1400	2181	1.0	3.8
1500	2196	1.0	4.1
1600	2210	1.0	4.4
1700	2225	1.0	4.7
1800	2240	1.1	5.0
1900	2255	1.2	5.3
2000	2270	1.3	5.6
2100	2285	1.4	5.9
2200	2301	1.5	6.2
2300	2317	1.6	6.5
2400	2333	1.6	6.8
2500	2349	1.6	7.1
2600	2365	1.7	7.4
2700	2381	1.8	7.8
2800	2398	1.8	8.1
2900	2415	2.0	8.4
3000	2432	2.1	8.7
3100	2449	2.2	9.1
3200	2466	2.3	9.4
3300	2484	2.4	9.7
3400	2502	2.5	10.1
3500	2520	2.6	10.4
3600	2538	2.7	10.7
3700	2557	2.7	11.1
3800	2576	2.8	11.5
3900	2595	2.9	11.8
4000	2614	3.0	12.2
4100	2633	3.1	12.5
4200	2653	3.2	12.9
4300	2673	3.3	13.3
4400	2693	3.4	13.6
4500	2714	3.5	14.0
4600	2735	3.6	14.4
4700	2756	3.7	14.8
4800	2777	3.8	15.2
4900	2799	4.0	15.5
5000	2821	4.0	15.9
5100	2843	4.2	16.3
5200	2866	4.3	16.7
5300	2889	4.4	17.1
5400	2912	4.6	17.6
5500	2936	4.7	18.0
5600	2960	4.8	18.4
5700	2985	4.9	18.8
5800	3010	5.1	19.3
5900	3036	5.2	19.7
6000	3062	5.4	20.2
6050	3075	5.4	20.4
6100	3088	5.5	20.6
6150	3102	5.6	20.8
6200	3115	5.7	21.1
6250	3129	5.7	21.3
6300	3143	5.8	21.5
6350	3158	5.9	21.7
6400	3172	6.0	22.0
6450	3187	6.0	22.3
6500	3201	6.1	22.5
6550	3216	6.2	22.7
6600	3230	6.3	23.0
6650	3245	6.3	23.2
6700	3259	6.4	23.5
6750	3275	6.5	23.8
6800	3290	6.6	24.0
6850	3306	6.7	24.3
6900	3322	6.8	24.5
6950	3339	6.9	24.8
7000	3355	7.0	25.1
7050	3372	7.1	25.4
7100	3388	7.2	25.6
7150	3405	7.3	25.9
7200	3422	7.5	26.2
7250	3440	7.6	26.4
7300	3457	7.7	26.7
7350	3476	7.8	27.0
7400	3494	8.0	27.3
7450	3513	8.1	27.6
7500	3532	8.1	27.9
7550	3552	8.3	28.2
7600	3572	8.5	28.5
7650	3593	8.6	28.9
7700	3613	8.8	29.2
7750	3635	8.9	29.5
7800	3656	9.0	29.8
7850	3679	9.2	30.2
7900	3701	9.4	30.5
7950	3725	9.6	30.9
8000	3748	9.8	31.2
8050	3773	10.0	31.6
8100	3798	10.2	32.0

II SIGHT ANGLE ABOVE 4000 MINUTES.

1. Set up control side for normal surface problem as in A1.

2. With Synchronize "E" knob in the "IN" position, introduce an arbitrary value such as 40° or 2400 minutes to make up the bulk of sight angle.

3. With Sight Angle knob "IN", introduce remainder of gun elevation as sight angle.

4. Handle drift difference and adjustments in range and deflection as above.

5. An alternate method of handling deflection since the deflection spotting knob is limited to 100 mils is to compute the correction to generated deflection and apply it to the Sight Deflection knob in the "IN" position. Spots will then be applied with the Sight Deflection knob. This system loses the benefit of generated deflection, but with a small range rate, this error may be neglected for a period of about five minutes. By pulling sight deflection knob out and recomputing and applying deflection corrections to the current generated deflection this error can be reduced somewhat but will cause guns to whip violently when knob is pulled out - if battery is in automatic.

NOTE: 1. In the above procedures, many errors caused by using low muzzle velocity powder have been neglected. Some of these are: the difference in effect of wind on the projectile for the two muzzle velocities; the difference in the ships motion effect across the line of fire for the two muzzle velocities in making up generated deflection; the I.V. setting in the rangekeeper, effect of ships motion in the line of fire; the fact that when the Fuze knob is "IN", a false advance range is made up. All the above errors may be reduced to a minimum if a firing course and speed is selected so as to give a small range rate.

2. The above procedures may also be used with 2600 f.s. high angle shooting employing values from Change I to O.P. 551, for determining sight angle and connections to generated deflection.

3. The attached range tables have been condensed from O.P. 1285. They may be used by ships that do not have that publication or in cases where they can be more conveniently employed in this form.

ANNEX CHARLIE TO DESTROYER TACTICAL BULLETIN NO. 3-45
5"/38 Cal., with 1200 f.s. I.V.
PROCEDURE FOR SHIPS WITH MARK 33 DIRECTOR

I SIGHT ANGLES BELOW 4000 MINUTES.

A. Director.

1. Set up control side for normal bombardment problem solving for set and drift as target course and speed, in order to generate Advance Range, Bearing Rate, and Sight Deflection.

2. Illumination Officer is in charge of follow up side in communication with C.I.C. and Control Side.

3. Lock Sight Angle knob "IN".

4. Set sight angle manually before each salvo to value determined from sight angle curve based on advanced range.

5. Apply range spots to Range Spot knob. This will change Advance Range and will require a new sight angle.

6. Sight Deflection knob "OUT".

7. Apply drift difference on Deflection Spot knob. For deflection adjustments, use normal shore bombardment procedure.

8. If air burst is ordered, set Fuze knob "IN" and set fuze setting to time of flight. Order guns to "match up" and set fuzes.

9. Wait for "set" from follow up side before firing each salvo.

B. BATTERY.

1. Set fuze setters on safe. (Shift to manual if necessary and keep set on safe until directed to "match up".)

2. Be alert to open the breech by hand if the gun does not recoil fully. DO NOT OPEN BREECH without orders from Control, if salvo latch has not tripped.

3. An additional observer should be stationed where he can observe the muzzle to determine if gun has fired in case the Gun Captain did not observe the recoil and is not sure of the gun having been fired.

VI The above procedures may also be used with 2600 f.s. high angle shooting employing values from Change I to O.P. 551, for determining sight angle and corrections to generated deflection.

NOTE: The attached range tables have been condensed from O.P. 1285. They may be used by ships that have not received that publication or in cases where they can be more conveniently employed in this form.

III SIGHT ANGLE OVER 4000 MINUTES.

A. Director.

Use director as above.

B. Plot.

1. Set up as above.
2. With the Synchronize "E" knob in the out position, introduce an arbitrary value of elevation such as 40 degrees or 2400 minutes to make up the bulk of sight angle. (One full revolution counterclockwise of Synchronize "E" ring dial is ten degrees, or 600 minutes.)
3. With Sight Angle knob "IN", introduce remainder of gun elevation as sight angle.
4. Handle drift difference and adjustments in range and deflection as above.

IV As a plotting room procedure, it is recommended that the Plotting Room Officer be the range table reader (the advanced range to sight angle converter). Spots will be received from C.I.C. The elevation operator will set in Dj and Drift difference correction. The sight angle operator will set Rj and corrects Vs to the new R2. The plotting room officer will give the new Vs to the sight angle operator as required. When set, the sight angle operator should so inform Plotting Room Officer as he (Vs operator) is in closest touch to the correct setting of R2 and Vs. Plotting Room Officer then either informs Control "Ready " if Control is handling the guns, or Plotting Room Officer gives order "load" to the guns. When guns are loaded either Control or Plotting Room Officer gives permission to fire and Vs operator orders "Fire" when R2, Vs, and Dj are in best limits of accuracy. If Vs operator sees that change in R2 has made Vs and Dj settings inaccurate he reports to Plotting Room Officer "Sight Angle Not Set" and a new setup is made.

V BATTERY.

A. Be alert to open the breech by hand if the gun does not recoil fully. DO NOT OPEN BREECH, without orders from Control, if the salvo latch has not tripped.

B. An additional observer should be stationed where he can observe the muzzle to determine if gun has fired in case the Gun Captain did not observe the recoil and is not sure of the gun having been fired.

ANNEX CHARLIE TO DESTROYER TACTICAL BULLETIN NO. 3-45
5"/38 Cal., with 1200 f.s. I.V.
PROCEDURE FOR SHIPS WITH MK. 37 DIRECTOR AND MK. 1 COMPUTER

I GENERAL INFORMATION.

The use of a low muzzle velocity powder throws out the accuracy of the Mark 1 Computer in the generated problem, but it has been found that these inaccuracies can be for the most part neglected. Several of these are: The difference in effect of wind on the projectile for the two muzzle velocities; the I.V. setting in the computer; effect of ship's motion in the line of fire; the difference in the ship's motion effect across the line of fire for the two muzzle velocities in making up generated deflection. The above errors may be reduced to a minimum if a firing course is selected so as to give a small range rate or zero range rate.

II SIGHT ANGLES BELOW 4000 MINUTES.

A. Director.

Same as for normal shore bombardment using director line of sight for direct fire.

B. Plot.

1. Set Computer in semi-automatic for direct fire, in local for indirect.
2. Set up normal bombardment problem solving for Set and Drift as target course and speed in order to generate bearing rate, Advance Range and Sight Deflection.
3. Put Sight Angle knob "IN".
4. Set sight angle manually before each salvo to value determined from sight angle curve based on Advance Range.
5. Apply range spots with range spot knob "IN". This will change advance range and require a new sight angle.
6. Sight Deflection knob "OUT".
7. Apply drift difference on Deflection Spot knob. For deflection adjustments, use normal shore bombardment procedure.
8. If air burst is ordered, set Fuze Knob "IN" and set fuze setting to time of flight.

ANNEX CHARLIE TO D.T.B. 3-45

"REDUCED VELOCITY CHARGE PROCEDURE"

WITH RANGE TABLES

APPENDIX ONE TO COMMUNICATION ANNEX
DESTROYERS

FIRE SUPPORT GROUP	FIRE SUPPORT SHIP	VOICE CALL	CW CALL (DO NOT ENCIPHER	PLANE CALL (SHIP BASED)	NAVAL GUNFIRE CONTROL NET (COMMON FREQUENCY)	GUNFIRE SUPPORT FREQUENCIES (SFCP FREQUENCIES			CODE NAME
ONE	1______	AMAZON*	KG2A	*(ACE AMAZON)	5615 KCS	SFC1	NL01	P-3814	ASIA
	2______	APPLESAUCE*	KG2B	*(KING APPLESAUCE)	(CODE NAME)			(S-5790)	AKRON
				*(QUEEN JACK)	HOCUS POCUS				
TWO	1______	BUTTERBALL*	KG2C		" "	SFC2	NL02	P-3845	BALTIC
	2______	BACKSTAGE*	KG2D					(S-5755)	BERLIN
THREE	1______	CORKY*	KG2E		" "	SFC3	NL03	P-3900	CHINA
	2______	CORNPONE*	KG2F					(S-5690)	CALCUTTA
FOUR	1______	DOUGLAS*	KG2G		" "	SFC4	NL04	P-5660	DARIEN
	2______	DOGWOOD*	KG2H					(S-4162)	DALMATIA
FIVE	1______	EDWARD*	KG2I		" "	SFC5	NL05	P-4335	ERIE
	2______	EMPHASIS*	KG2J					(S-3925)	ELKTON
SIX	1______	FREDERICK*	KG2K		" "	SFC6	NL06	P-3958	FRANCE
	2______	FIREBALL*	KG2L					(S-4860)	FRISCO
SEVEN	1______	GEORGE*	KG2M		" "	SFC7	NL07	P-5630	GERMANY
	2______	GANDER*	KG2N					(S-4095)	GUTHRIE
EIGHT	1______	HENRY*	KG2O		" "	SFC8	NL08	P-4925	HULL
	2______	HOTSPOT*	KG2P					(S-4135)	HAMBURG
NINE	1______	IRVIN*	KG2Q		" "	SFC9	NL09	P-4766	INDIA
	2______	INKWELL*	KG2R					(S-5140)	ILLINOIS
TEN	1______	JASPER*	KG2S		" "	SFC10	NL010	P-5235	JERSEY
	2______	JODHPOR*	KG2T					(S-4018)	JAMAICA
ELEVEN	1______	KNOTHOLE*	KG2U		" "	SFC11	NL011	P-4477	KENTUCKY
	2______	KEYHOLE*	KG2V					(S-5020)	KODIAK

*Note: Plane calls are ships' own TBS call preceded by ACE, KING, QUEEN, or JACK denoting ships' plane number 1, 2, 3, or 4.

SHORE FIRE CONTROL CODE:

Use effective CSP 2156 series modified as follows:
(A) Voice is the normal method of transmission.
(B) Ships habitually repeat all transmissions sent by the SFCP.
(C) After satisfactory communications have been established with SFC or NLO, only the number and one letter immediately preceding the number need be employed as an SFC or NLO call. (Example: SFC8 is shortened to C8; NLO5 to O5).

NOTE: Do not use USF75 for shore spotting.

(D) When spotting planes are used procedure as outlined in paragraph eight (8) of this annex will be employed.

COMMUNICATIONS WITH VESSELS PROVIDING SERVICES

Communications with LCI(L)_____, or similar vessel, performing incidental services such as landing observation parties, are normally only by visual methods. Since they do not have a regular radio watch, traffic for them will be forwarded on 355 kcs to ComDesPac, who will effect delivery on their assigned schedules with the LCI(L). However, the LCI communicates with "Shore" at certain times using voice on the common frequency.

SPECIAL CALLS

COMMANDER ATTACK FORCE - - - - - - - - - - - - LANCELOT (OCE)
SHORE COMMAND - - - - - - - - - - - - - - - - MUD PIE
ALL SHIPS - - - - - - - - - - - - - - - - - - BOYS TOWN
SHORE BASED SPOTTING PLANE - - - - - - - - - - "ACE", "KING", "QUEEN" Etc.
LCI(L), LCM, etc. - - - - - - - - - - - - - - CHARIOT

GEOGRAPHICAL REFERENCE POINTS:

1. Smuggler's Cove, Kahoolawe - - - - - - - - ROOT BEER
2. Kealaikahiki Point - - - - - - - - - - - - - LEMONADE
3. Maalea Bay, Maui - - - - - - - - - - - - - - COCO-COLA
4. Hilo, Hawaii - - - - - - - - - - - - - - - - GINGER ALE
5. Pearl Harbor - - - - - - - - - - - - - - - - HAIR TONIC

APPENDIX ONE TO COMMUNICATION ANNEX
DESTROYERS

ESTABLISHING COMMUNICATIONS:

Ships will report in and establish communications with Commander Attack Force (LANCELOT) on the Naval Gunfire Control Net (5615 kcs) ONE HOUR before initial bombardment exercises are scheduled to commence.

When directed by LANCELOT open communications with the SFCP on frequency designated by code word. (During own firing destroyers not having two voice transmitters will have to shift TBL over to the spotting net, and then back to 5615 kcs at the conclusion of own firing period(s) while the Naval Gunfire Control Net will be guarded and logged continuously. When directed by the SFCP to secure from his net, Firing Ship(s) (Groups) report to LANCELOT completion of call fire, effect if observed, and in Shackle Code the percentage of bombardment allowance remaining on board.

SHORE BASED PLANES:

Shore based planes towing sleeves for Exercise G will be on 3900 kcs voice call "TRACTOR". Shore based planes furnishing air spot will stay on common frequency 5615 kcs and will spot on this frequency or may, in case of OS2U spotting aircraft, shift to Shore Fire Control spotting frequency when directed. Calls are "ACE", "KING", "QUEEN", etc.

AIRSPOT WHEN SHIP BASED PLANES ARE PARTICIPATING:

During Exercises A,B,C,D, and E planes will be on the Naval Gunfire Support Net frequency (5615 kcs). Planes will not spot for Exercises A,B,C and D unless so directed.

In order that aircrews and ship's personnel may become familiar with the airspot doctrine for call fires, parent vessel will direct the spotting plane(s) to shift to the appropriate frequency for exercises F,H, and I. Plane(s) will establish communication for call fire by checking in with the SFCP on his frequency, prepared to furnish spot if directed by him. When SC1 aircraft are used it must be remembered that only one preset spotting frequency is available for use at any one time, frequency must be assigned and set prior to exercise.

DISTRESS AND AREA FREQUENCY GUARD:

500 kcs (Distress Frequency) will not be guarded in the area. The OCE guard 355 kcs (Area Frequency) for ships in company from two hours prior to HOW Hour until completion of the exercise.

12. WHEN TARGET IS NEUTRALIZED OR DESTROYED SPOTTING PLANE SENDS "CEASE FIRE" AND EFFECT OF FIRE.	(t) Spotting Plane sends: "IRVIN THIS IS ACE - CEASE FIRE - TARGET DESTROYED - OVER". (u) Firing Ship sends: "THIS IS IRVIN - CEASE FIRE - TARGET DESTROYED - OUT".
13. WHEN SHIP HAS CEASED FIRE SPOTTING PLANE REPORTS EFFECT OF FIRE TO NAVAL GUNFIRE SPOTTER.	(v) Spotting Plane sends: "CHARLIE NINE THIS IS ACE - TARGET DESTROYED - OVER". (w) Naval Gunfire Spotter sends: "THIS IS CHARLIE NINE - TARGET DESTROYED - OUT".

	(k) Firing Ship sends: "THIS IS IRVIN - TARGET AT 4651 NAN - CLOSE SUPPORTING FIRE - FIRE AT MY COMMAND - OUT".
5. FIRING SHIP REPORTS WHEN READY TO FIRE AND SENDS TIME OF FLIGHT BEFORE FIRST SALVO ONLY OF ADJUSTMENT ("READY TO FIRE" AND "TIME OF FLIGHT" NOT TRANSMITTED TO SLOWER SPOTTING PLANES.)	(l) Firing Ship sends: "THIS IS IRVIN - READY TO FIRE - TIME OF FLIGHT 20 SECONDS - OUT".
6. FIGHTER SPOTTING PLANE REQUESTS SHIP TO "STAND BY" AND WHEN HE DESIRES SHIP TO COMMENCE FIRING TRANSMITS "FIRE". ("STANDBY" AND "FIRE" NOT TRANSMITTED BY SLOWER SPOTTING PLANES).	(m) Spotting plane sends: "THIS IS ACE - STAND BY - FIRE - OVER".
7. SHIP REPORTS THAT SALVO HAS BEEN FIRED WHEN GUNS FIRE.	(n) Firing Ship sends: "SALVO"
8. SHIP REPORTS "SPLASH" OF SALVO THREE SECONDS BEFORE ESTIMATED TIME OF IMPACT.	(o) Firing Ship sends: "SPLASH" - OVER"
9. SPOTTING PLANE TRANSMITS SPOT.	(p) Spotting Plane sends: "THIS IS ACE - UP 600 RIGHT 300 - OVER".
	(q) Firing Ship sends: "THIS IS IRVIN - UP 600 RIGHT 300 - OUT".
10. STEPS 6, 7, 8, and 9 ARE REPEATED UNTIL SPOTTING PLANE DESIRES "RAPID FIRE". SHIP SENDS "SALVO" AND "SPLASH" SIGNALS ON FIRST SALVO ONLY OF RAPID FIRE AND "ROUNDS COMPLETED" AFTER FIRING LAST SALVO.	(r) Spotting Plane sends: "THIS IS ACE - (REQUIRED SPOT OR NO CHANGE) - RAPID FIRE FIVE SALVOS (OR RAPID FIRE ONE MINUTE OR RAPID CONTINUOUS FIRE TWO MINUTES OR SALVO FIRE FIVE SALVOS PER MINUTE FOR THREE MINUTES).
	(s) Firing Ship sends: "THIS IS IRVIN - (REQUIRED SPOT OR NO CHANGE) - RAPID FIRE FIVE SALVOS (OR RAPID FIRE ONE MINUTE OR RAPID CONTINUOUS FIRE TWO MINUTES OR SALVO FIRE FIVE SALVOS PER MINUTE FOR THREE MINUTES) - SALVO - SPLASH - ROUNDS COMPLETED - OUT".

11. STEP 10 IS REPEATED UNTIL THE REQUIRED NEUTRALIZATION OR DESTRUCTION IS COMPLETED.

COMMUNICATION PROCEDURE FOR SHORE FIRE CONTROL PARTY, FIRING SHIP, AND SPOTTING AIRCRAFT WHEN AIRCRAFT IS SPOTTING SHIP'S FIRE.

Procedure employed in this code is the same as prescribed in Combined Radio Telephone (R/T) Procedure, 1942.

1. SPOTTING PLANE ESTABLISHES COMMUNICATION WITH NAVAL GUNFIRE SPOTTER AND FIRING SHIP.	(a) Naval Gunfire Spotter sends: "CHARLIE NINE AND IRVIN THIS IS ACE - HOW DO YOU HEAR ME - OVER". (b) Firing Ship sends: "ACE THIS IS CHARLIE NINE - LOUD AND CLEAR - OVER". (c) Spotting Plane sends: "ACE THIS IS IRVIN - LOUD AND CLEAR - OVER". (d) Naval Gunfire Spotter sends: "THIS IS ACE - OUT".
2. NAVAL GUNFIRE SPOTTER SENDS OWN FRONT LINES TO FIRING SHIP AND SPOTTING PLANE (EITHER BY COORDINATES OR TARGET AREA SQUARES).	(e) Naval Gunfire Spotter sends: "IRVIN AND ACE THIS IS CHARLIE NINE - OWN FRONT LINES ARE LOCATED FROM 4591 CHARLIE TO 4612 DOG - OVER". (f) Firing Ship sends: "THIS IS IRVIN - OWN FRONT LINES ARE LOCATED FROM 4591 CHARLIE TO 4612 DOG - OUT". (g) Spotting Plane sends: "THIS IS ACE - OWN FRONT LINES ARE LOCATED FROM 4591 CHARLIE TO 4612 DOG - OUT".
3. WHEN READY NAVAL GUNFIRE SPOTTER DESIGNATED TARGET TO SPOTTING PLANE AND REQUESTS TARGET TO BE TAKEN UNDER FIRE.	(h) Naval Gunfire Spotter sends: "ACE THIS IS CHARLIE NINE - CAN YOU OBSERVE ARTILLERY AT APPROXIMATELY 4651 NAN - IF YOU CAN OBSERVE TAKE UNDER FIRE IMMEDIATELY - OVER". (i) Spotting Plane sends: "THIS IS ACE - WILCO - OUT".
4. WHEN READY FIGHTER SPOTTING PLANE DESIGNATES TARGET AND ORDERS "FIRE AT MY COMMAND" (SLOWER SPOTTING PLANES ORDER "COMMENCE FIRING").	(j) Spotting Plane sends: "IRVIN THIS IS ACE - TARGET AT 4651 NAN (OR ANY OTHER COORDINATES DEPENDING UPON PLANE OBSERVATION) ARTILLERY - CLOSE SUPPORTING FIRE - FIRE AT MY COMMAND - OVER".

Destroyer gunfire support in landing operations.

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